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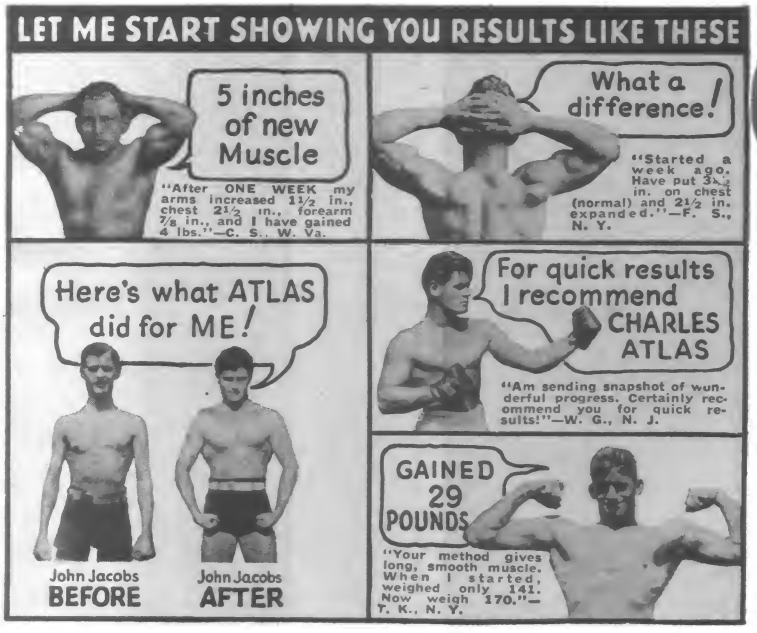

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July 1938

Mechanics AND HANDICRAFT

Vol. 5 No. 6

NED L. PINES, *Publisher*

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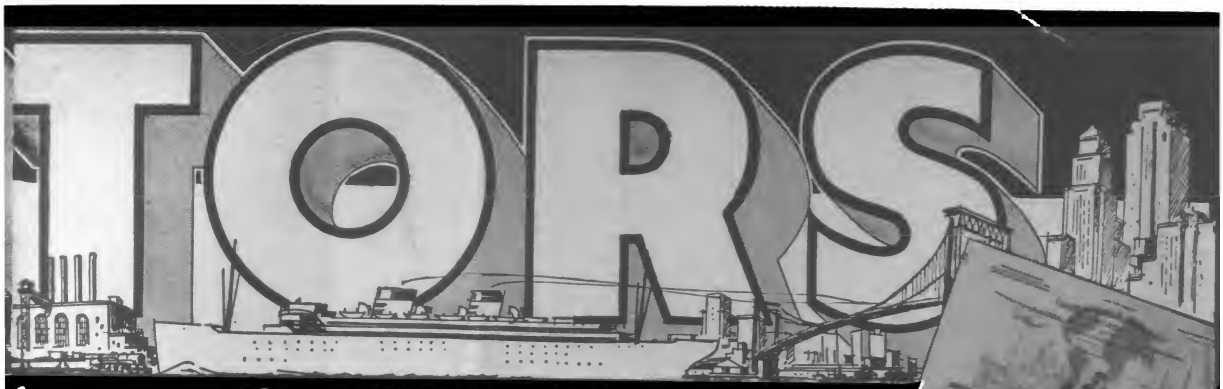

Invention Ready For These Waiting Markets

Keen competition in every form of industry has put manufacturers feverishly at work trying to speed up output, reduce overhead, save on materials, outsell trade opponents. The inventor is the key-man in making advancement possible to any business. Upon the inventor rests the success of many enterprises. This does not mean that you must have something gigantic to win commercial success. A new way to open a door or button up a shirt may be the very thing hundreds of manufacturers are looking for.

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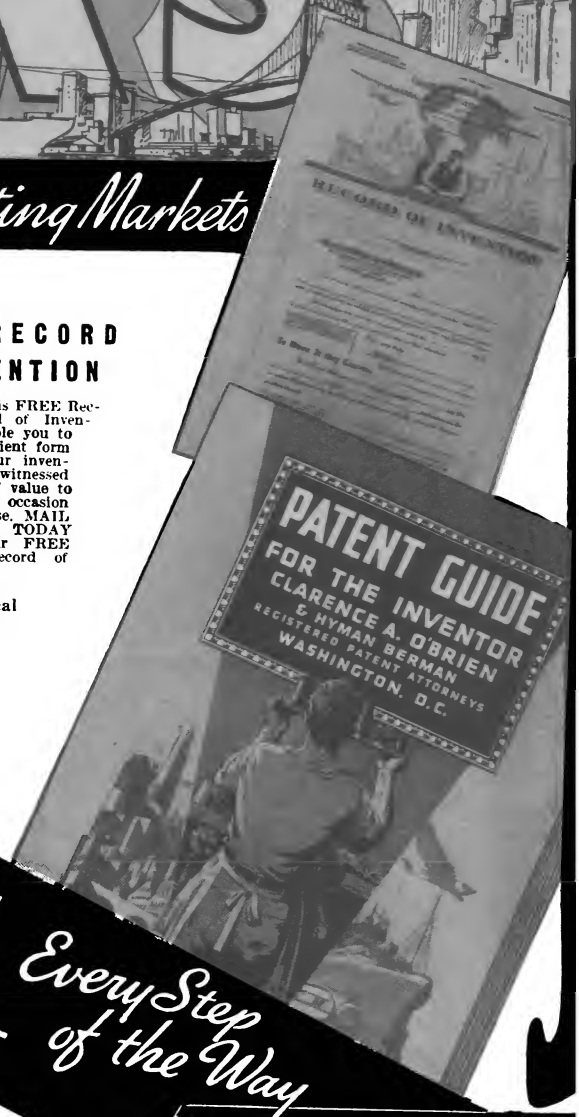

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Editorial Jottings

LEADING aeronautical magazines proved—on paper—that man could fly faster than five hundred miles an hour. Those same magazines also adhered to the belief that the deer botfly was capable of a speed of flight of 818 miles per hour. . . . But science has debunked both beliefs. . . . Dr. Irving Langmuir conducted considerable research on the problem of the deer fly's alleged high velocity of flight and concludes that the speed of flight of this insect is probably 25 m.p.h.

Any insect of the size of the deer fly, states Dr. Langmuir, traveling at such a theoretical speed, would exert a force of about four tons per square inch if it struck something while in flight. Thus, it becomes a rather efficient bullet. That same insect would have to develop about five tenths of a horsepower and consume more than its own weight in food for every second of its flight. . . .

* * *

AND science again comes back to an old discarded theory. . . Dr. Phillip R. White of the Rockefeller Institute of Medical Research, growing roots of tomato plants in bottles, determined that those roots actually developed pressure which would be sufficient to push sap up into the stems of plants . . . pressures as high as one hundred and twenty-five pounds per square inch have been measured . . .so, perhaps, "suction" does not pull the sap up . . . perhaps, on the other hand, a combination of the two forces—and some as yet not discovered—are responsible. . . .

* * *

TWENTY-FIVE years ago Cancer occupied seventh place as the cause of mortality, today it takes second place among the causes of death. This does not necessarily mean that cancer is on the increase. . . . More people live to old age . . . Cancer is more readily recognized by the modern physician. . . . Death certificates are more carefully prepared. . . . Nevertheless, in headline position occupied by cancer and heart disease ultimately will be eliminated. . . .

* * *

MANNERS, customs and ideals of peoples change with the times however, many of the World's powerful rulers still find satisfaction in playing "soldiers" . . . But even play has changed considerably . . . Thirty years ago, boys vied with each other in preparing and flying kites; virtually every home had a fret-saw outfit, a pyrography set and toy construction parts. . . . The chemical laboratory in the cellar was commonplace. . . . Electric toy-making outfits enjoyed great popularity. . . . The revival of interest in photography and the many new developments which have occurred in this field may re-awaken interest in personal research and experiment in the many other fascinating fields of physics. . . . While the youth of today may have forgotten how to play, the pursuit of hobbies appears to be the domain of the adult.

JOSEPH H. KRAUS, *Editor.*

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ELECTRIC INSECT KILLER

STANDARD electric lamp insect killer. $2.00 up. Literature free. Sauer Bros., 14820-D Foothill Blvd., San Leandro, Calif.

FOOT REMEDIES

ATHLETES Foot, itching, burning, sweating, smelly feet, cured quickly. Send fifty cents for complete treatment. Box 1012-B, Chicago.

FOR ADVERTISERS

FREE! New, profitable information showing how to start profit-making mail order business with small capital at home. Enclose stamped addressed envelope, for full "Silent-System" details. Do it now. D. Marshall, 2142 W. Crystal St., Chicago, Ill.

FOR INVENTORS

FREE booklet (copyrighted) for inventors explains selling facts and buyer locating method that may save you costly mistakes and lead to profitable sale of your patented, unpatented invention. For free copy write: Invention Reporter, H-11236 So. Fairfield, Chicago.

HAVE you a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 13, Washington, D. C.

FORMULAS

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CL-1142 Sunnyside, Chicago.

FORMULAS—Latest money makers. Literature free. R. Belfort, 4042 N. Keeler, Chicago.

FORMULAS: Tested moneymaking formulas (15) for $1.00. Real unusual offers. Marvel Laboratories, 6629 No. Maplewood, Chicago.

GUARANTEED formulas—all kinds—catalog free. Kemico, 250, Parkridge, Ill.

NEW! Safe; non-inflammable, better dry cleaning fluid. Inexpensive. Formula, 25c (coin please). Harvey Gernhart, Box 822, Chadron, Nebr.

THREE popular formulas tested, guaranteed. Resilvering mirrors, Iceless Ice, Luminous Paint. 25c (coin). Executive Chemical Research, 789 N. W. 34th Street, Miami, Florida.

HOBBIES AND RECREATION

HOBBIES, recreation, opportunity, trailers. Exchange information, ideas, friendly cooperation, with men or women of congenial interests, near or distant. Wider mental, social, economic opportunities. Private service available. Postage requested. Hobbies "Central," Box 4, Station A, Meriden, Conn.

(*Continued on page* 16)

CLASSIFIED ADVERTISING

(*Continued from page* 14)

(*Continued on page* 20)

Be a wholesale manufacturer. Let the storekeepers sell your product. Frazier and Rarick lined up 580 dealers their first two weeks in business and had an output of 180 pounds a day.

YOU can be one of a country-wide Chain producing Vita-Seald — the one, standard National Brand of Potato Chips, known everywhere as the most delicious of Potato Chips and at the same time, famous for its health giving qualities due to our unique method of extracting excess grease and retaining the 9 vital minerals so essential to good health.

I'll Start YOU in the Potato Chip Business

and show you how you can "coin money" right in your own kitchen

I'm Talking

to Men and Women who want to own a permanent business that can pay

Big Daily Profits from the Start
Without Overhead Expense

Think of it! You buy potatoes at 2c a pound and sell them as potato chips at 35c a pound

That's what I call a *business*. Just write to me and I'll give you without obligation, the amazing facts about the sweetest, soundest business proposition you ever dreamed of.

NOT long ago it took a lot of money to break into the Potato Chip business. Now, you can start with so small an investment you'll be surprised and "raring to go." You don't need a store or factory. Start right in your own kitchen and *grow*. My compact, efficient, Vita-Seald Machine represents years of engineering experience. This machine with its high-speed slicer and oil extractor, is all you need to turn out delicious, golden brown Vita-Seald chips which are the rage of the Century. No wonder they sell like hot cakes wherever introduced. When you get your Vita-Seald equipment, you are ready to start making money the very first day. I supply you with everything necessary including beautiful, embossed Vita-Seald trademarked bags and free advertising material. But I do not stop at that. I also furnish you a book of instructions telling exactly how to start and build a business which will produce profits to satisfy any man's ambition.

Experience Not Needed

Here's a business where selling is no problem. You don't need to create a demand for Potato Chips. Millions of pounds are sold and eaten daily. All you have to do is make the kind of chip I will show you how to make, and the orders will flock in.

This is where the Vita-Seald secret comes in. When I discovered how to make a greaseless, mineralized Potato Chip, I revolutionized the Potato Chip business and started to build a nation-wide chain of small home-factories, all making and selling the same famous Vita-Seald brand of chips. When I start you in business, I give you full rights to the use of the nationally known Vita-Seald trademark. Just think what it means to produce a famous brand of food instead of a nameless product! Already hundreds of Vita-Seald manufacturers are cleaning up big profits —but the surface is hardly scratched. There's room for thousands! It takes lots of chips to supply the appetites of America's millions!

Few people realize what a big profit margin there is in making Potato Chips. Only $2.50 invested in raw materials brings back $10.00 in cash at wholesale. Profits roll in day in and day out. There's no limit to the volume you can do nor the territory you can cover—but "start small and grow big" is my motto. Who knows but some day you may be the Potato Chip King of your state?

Don't Buy Anything — Just Write Me Today!

If you think you want a part in this big-profit industry, let's get down to business. I don't expect you to jump in blind. I want you to make a thorough investigation. Put it up to me to explain and prove every detail. But for heaven's sake, don't hang back through fear I'm going to ask you to put up a lot of money. You'll be astounded at the liberal proposition I have to make you. Just send me your name and address on a card and say, "Show me." I'll then give you the secret of making greaseless, mineralized Potato Chips and every bit of information I have gathered during years of experience in this line. There's no cost or obligation, yet this may prove to be the most important step you have ever taken to insure a future free from money worries. Address your letter or card personally to me:

George H. Hardt — 325 W. Huron St., Dept. D-507, Chicago, Ill.

CLASSIFIED USERS WRITE THEIR OWN TESTIMONIALS

Results from All Over the World

It is with pleasure that I can tell you of the wonderful results obtained by using a classified ad in your fine magazine. We not only have had letters of inquiry from every state in the Union, but also from Canada, Hawaii, England and the Philippines.

Have had hundreds of letters—many times six to a dozen in our mail.

Want to congratulate you for publishing a magazine that is so popular the whole world over.

Cordially,
JAY VAN HORN.

One of the Very Best Mediums

I wish to say that MECHANICS AND HANDICRAFT is one of the very best mediums on my list.

Sincerely,
LEE MOUNTAIN

Renew My Ad for Another Year

Results have been splendid.

Please renew my ad for another year and on receipt of your invoice I will send check for one year's advertising at the same rate I contracted for last year.

C. W. JAMER,
Box 4, Bayside, N. Y.

Expression of Gratification

As your magazine, MECHANICS AND HANDICRAFT, has carried an advertising notice about our hobby, recreation and information, exchange service for many months, and as the interest in our service is growing stronger each month, we are writing to express our gratification and that of our clientele for the help that your magazine has given us in broadening the scope of our service.

We thank you for your splendid cooperation, and trust that MECHANICS AND HANDICRAFT may serve our interests as well for many years.

Sincerely yours,
N. E. DOWNES,
Hobbies, "Central."

CLASSIFIED ADVERTISING

(*Continued from page* 16)

TWO beautiful double-weight professional enlargements, 8 guaranteed never fade prints, 25c coin. Century Photo Service, LaCrosse, Wisconsin.

PRINTING

PRINT 100 copies of line drawings in any colors for 5c with simple home made device. Also handles printed or typewritten copy. Illustrated instructions and samples 25c coin. Designer—F, Box 916, Springfield, Mass.

RADIOS, SUPPLIES AND INSTRUCTIONS

RADIO tubes rejuvenated, instructions—$1.00. Radiolectric Co., Geraldton, Ontario, Canada.

SALESMEN WANTED

NO selling! Steady work—big pay daily. Be my local buyer. Money furnished. Details free. Pruitt Co., 1182 Pruitt Bldg., Chicago.

SALESMEN calling on hardware and department stores, sell Nevertwist Clothesline Winders. Also men and women for house to house selling. Sample and demonstrator, 50 cents. Fehlau Clothesline Winder Co., 12415 Gruss Ave., Cleveland, Ohio.

SONG POEMS WANTED

SONGWRITERS: Send best poem today for exceptional offer. Richard Brothers, 48 Woods Building, Chicago.

SONGWRITERS wanted, write for free book, 50-50 plan, splendid opportunity. Song Bureau, Dept. G, Salem, Indiana.

WANTED original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 105, Toronto, Canada.

SPORTING GOODS

RIFLES, shotguns, S&W, Colts, target pistols, air rifles, hunting knives, binoculars, telescopes, police goods, badges, holsters, etc. Bargain catalog 3c. Lee Sales (Dept. MH), 35 West 32nd St., New York.

STAMP COLLECTING

NEW Riviera nude stamp! World's largest triangle! Congo, Sudan, South Seas, bicolors, pictorials and many others. Only 3c with approvals. Cactus Junior Approvals, Box 1870-F, Tucson, Arizona.

TALENT WANTED

JOKE-sketch, photos, ideas bought. Write today. Want Add World, Box 280, Mansfield, Ohio.

TELEGRAPHY

TELEGRAPHY taught thoroughly. New railroad retirement act creating demand for operators at good salaries. Expenses low. Catalog free. Dodge's Institute, Peace St., Valparaiso, Indiana.

TELESCOPES

ASTRONOMICAL telescope lenses, $2.50 set. Jamer, Box 4, Bayside, N. Y.

LENS set—Makes 3" diameter 75-150 power astronomical telescope. $1.00 postpaid. 60X, 2" kit 50c. Optical Works, MH-6C, Milton, Pa.

TELESCOPES, Microscopes, Binoculars, Mineralogy, Chemistry. Catalog free. Teeko, Evanston, Illinois.

TELESCOPES, Microscopes, Binoculars: 1938 bargain catalog free. Brownscope Company, 5 West 27th Street, New York.

TYPEWRITER SUPPLIES

RIBBON, 50c 100 (box) Carbons, $1. Guaranteed. Office supplies. Roth Printing, Jamaica, New York.

WIND ELECTRIC PLANTS

BUILD wind light plant. Complete plans and valuable catalog 10c. Wind plant parts, welders, electric fences. LeJay Mfg., 452 LeJay Bldg., Minneapolis, Minn.

What Do You Know?

This magazine will pay $1.00 for each scientific question and answer accepted and published. Questions may be on any subject dealing with any science, including invention, mechanics, and handicraft. Source of information (that is, name of book or authority) must be given. No questions will be returned. Address all material to What Do You Know Editor, in care of MECHANICS AND HANDICRAFT, 22 West 48th St., New York, N. Y.

QUESTIONS:

Rate yourself 12½% for each question answered correctly. Thirty percent is a good mark.

1—Where did the common or Irish potato originate?

2—People use the expression "as blind as a bat"—

a—Are bats blind?

b—Do they fly into your hair?

3—What truth is there to the statement "his hair stood on end from fright."

4—A man throws a baseball horizontally for a distance of a hundred feet; a boy tosses one for a distance of twenty feet. The height above the ground is the same in both cases. How much longer will it take for the ball, tossed by the man, to reach the ground?

5—Do dogs with hydrophobia fear water?

6—Which is more efficient as a source of illumination—a four watt glow lamp or the firefly?

7—Given only a 5-lb. weight and a spring, how would you go about measuring small quantities of material from one ounce up?

8—Are wood eating insects edible?

ANSWERS:

1—The Irish potato originated in Chile, South America. It was introduced in Europe between 1535 and 1585, following the Spanish conquest of Peru and Chile.

2—Bats have eyes and use them, (with the exception of a few cave-dwelling species). They are among the most accurate fliers known and get entangled in nothing.

3—Fear is a powerful emotion. Many have felt chills "creeping up and down the spine." This is due to a tightening of the muscles of the skin; hence hair might be made to stand on end.

4—Both balls will strike the ground at the same time.

5—The literal translation of hydrophobia is "fear of water," but the diseased dogs do not fear water. They find it impossible to drink because of swelling of the throat muscles.

6—The estimated efficiency of a firefly is given as 99.5%. No lamp ever made by man can approach this figure.

7—Fasten the spring to a support, attach the weight to the free end and measure the distance of stretch, then divide by five to indicate 1-lb. markings and sub-divide further.

8—In India, termites are roasted and eaten. Toasted termites are available at oriental market places.

Official Air Conditioning Service Manual

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Flexible, Loose Leaf
Leatherette Cover

$5.00
a copy

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History of Air Conditioning; Fundamental Laws; Methods of Refrigeration; Ejector System of Refrigeration; Compression System of Refrigeration; Refrigerants; Lubricating Oils; Liquid Throttle Devices; Servicing Expansion and Float Valves; Servicing Refrigerating Systems; Control Devices; Thermodynamics of Air Conditioning; Weather in the United States; The Field of Air Conditioning; Insulating Materials; Heat Transmission Through Walls; Complete Air Conditioning Systems; Estimating Requirements for the Home, Small Store, Restaurant; Layout of Duct Systems; Starting Up a System; Operating and Servicing Air Conditioning Systems; Air Filtration, Ventilating and Noise Eliminating Devices; Portable Electric Humidifiers and Room Coolers; Automatic Humidifiers; Air Conditioning Units for Radiator Systems and Warm Air Systems; Central Conditioning Units, etc.

THE BEACON
22 West 48th St. New York

A GOLDEN OPPORTUNITY FOR ALERT MEN IN THE NEXT GREAT INDUSTRY

The idea of electricians, radio service men and other mechanically inclined men servicing Air Conditioning and Refrigeration Units self-evident and the thought has occurred to some untold thousands ever since air conditioning equipment has been installed in public auditoriums, theatres, studios, department stores, office buildings and manufacturing plants. The tremendously broad possibilities in this new industry are bound to give employment and success to men far-sighted enough to see its advancement and development. We quote an excerpt from Mr. Hugo Gernsback's editorial which appeared in a recent issue of Everyday Science and Mechanics:

> "I advise young and progressive men to go into the air-conditioning business during the next few years; because this, without a doubt, is the coming industry in this country. Thousands of small firms will spring up, undertaking to air-condition private houses, small business offices, factories, etc. We are not going to tear down every building in the United States immediately. It will be a gradual growth; yet small installation firms will air-condition small houses, and even single offices in small buildings."

This is only partial proof of the certain success of this new field. Further assurance is that engineering schools have already added many important courses on air conditioning to their regular curriculum. Architects and building contractors are giving considerable thought to installation of this equipment in structures which are now being planned and built. The beginning of this business will probably be similar to the auto and radio industry, but in a few short years it will surpass these two great fields.

The OFFICIAL AIR CONDITIONING SERVICE MANUAL is edited by L. K. Wright, an expert and a leading authority on air conditioning and refrigeration. He is a member of the American Society of Refrigerating Engineers, American Society of Mechanical Engineers, National Association of Practical Refrigerating Engineers; also author of the OFFICIAL REFRIGERATION SERVICE MANUAL and other volumes.

In this Air Conditioning Service Manual nearly every page is illustrated; every modern installation and individual part carefully explained; diagrams furnished of all known equipment; special care given to the servicing and installation end. The tools needed are illustrated and explained; there are plenty of charts and page after page of service data.

Remember there is a big opportunity in this new field and plenty of money to be made in the servicing end. There are thousands of firms selling installations and parts every day and this equipment must be cared for frequently. Eventually air conditioning systems will be as common as radios and refrigerators in homes, offices and industrial plants. Why not start now—increase your earnings with a full or spare-time service business.

MAIL COUPON TO-DAY!

THE BEACON MH-7
22 West 48th Street, New York, N. Y.

Gentlemen: Enclosed you will find my remittance of Five Dollars for which you are to send me One Copy of the OFFICIAL AIR CONDITIONING SERVICE MANUAL, POSTAGE PREPAID.

Name .....

Address .....

City ..... State .....

(Send remittance in form of check, money order or unused U. S. Postage Stamps. Register letter if it contains stamps or currency.)

JULY, 1938
Volume 5
Number 6

Mechanics AND HANDICRAFT

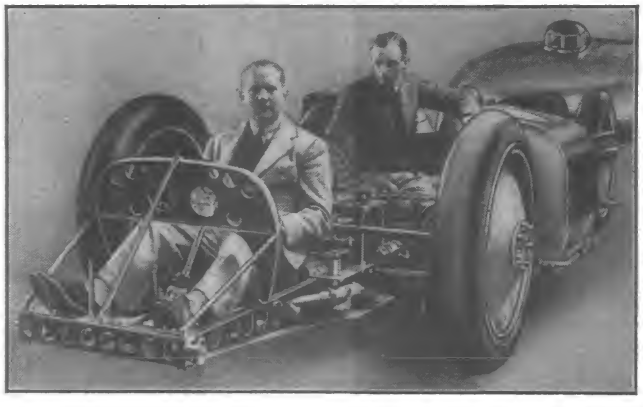
The Speed Turtle

New type of light auto designed for a speed of 350 miles per hour.

The peculiar shape of the new auto, expected to wrest the land speed record for autos, is made apparent in this photo.

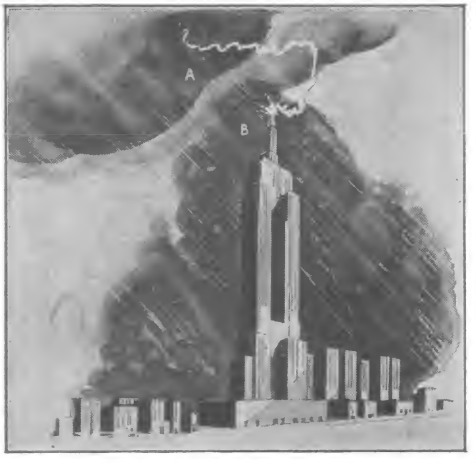
WHAT is probably the most revolutionary design for an automobile appears on this page. Despite the two potent 1250 horsepower engines which enable the car to travel at a precipitious rate, the entire mechanism weighs only three tons. Its detachable streamlined body can readily be lifted off the chassis in minimum time, so solving the rapid tire change and refuelling problems. Diametrically opposite to the leisurely turtle it resembles, the machine is the veritable epitome of lightness, speed and power, a mechanical Pegasus.

In this specially designed car, Mr. John Cobb, (shown at the wheel), will challenge the world's land speed record here in the United States on the Bonneville Salt Flats.



The driver occupies a position ahead of the front wheels, as shown above. Note body removed and at the rear. Right, close-up view of the racing car with the body removed. One will see that the front wheels are much further apart than the wheels at the rear.

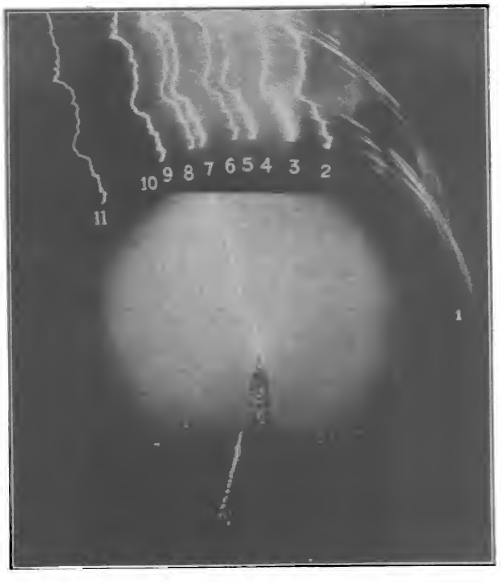
When Lightning Strikes *Upward*



Above — Constant discharge from a high spire opens the path from B to A for a lightning discharge from A to B.

FOR thousands of years people have watched the great electrical display in the heavens whenever a thunderstorm passed overhead and caused lightning discharges to take place; they have always believed that lightning struck *downward.* However, the latest studies of lightning discharges taking place in the vicinity of the Empire State Building in New York City have shown that in many cases a *lightning guide* first leaps upward from lofty structures.

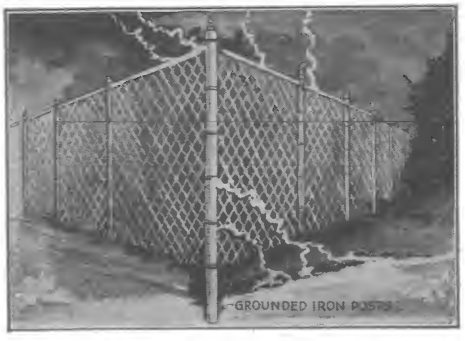
The accompanying photo shows in a remarkable way how these lightning guides were caught in the act of leaping upward from the tower of the Empire State Building. At the top of the photo eleven lightning bolts are shown striking at one time. Double lightning strokes are indicated at 4-5 and 9-10, but they appear to be single in this photo.



Center—An ordinary camera would take a picture of a lightning discharge as shown at the centre. A high speed camera discloses eleven discharges, 4-5, and 9-10 are double.

People have been warned by experts

(Continued on page 90)



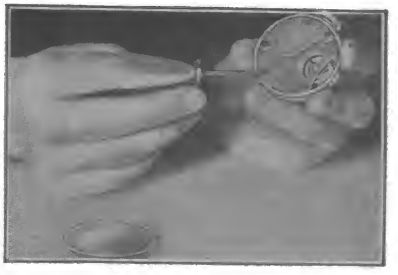
The lightning surge striking a fence may be so heavy that it will spray out as shown above.

It is not safe to stand near a tree in a thunderstorm. The ground surrounding becomes electrified and frequently the discharge sprays out from the trunk.

Left — Keep away from fences even though they are apparently grounded.

Tools Now Attached to Fingers

The three surrounding pictures display a series of ingenious gadgets designed to increase or moderate finger dexterity.



A GLOVE with rubber rays prevents Junior's hands from being too busy and constantly in his mouth. However, the lady above, wearing manicuring instruments, is made ten times more handy. No time is lost putting down a file to pick up an orange stick—she has everything at her finger tips. Even watch repairing is facilitated by attaching a tiny screw driver to the index finger.

These gadgets, mounted on thimble-like holders of thin bakelite, hard rubber or wood were perfected by Mrs. Greneker, a woman inventor who shows great promise.

Girl student blowing a glass bubble in University class.

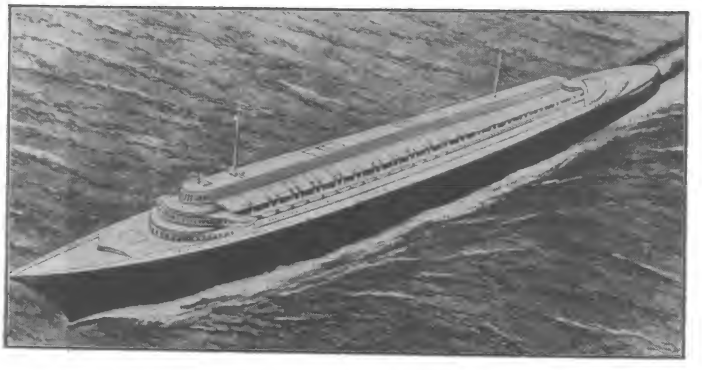
Co-eds Learn Glass Blowing

AN ancient art employed by the Egyptian and Phoenician tradesmen of 4000 years ago is being taught in the universities of today. Even women may practice it. Instructor C. C. Van Hespen of Chicago University and pupil Christine Palmer at left, are blowing a glass bubble.

A hollow iron rod is dipped in molten glass and the blob adhering is blown into a bubble. Shaping the bubble is accomplished by rolling it on a hot plate or blowing it into a mold.

Tomorrow's Streamlined Leviathan

FRENCH LINE officials propose building such a streamlined vessel. Funnels are to be eliminated and the smoke expelled through ducts in the ship's hull. About 1350 feet long and capable of 37 knots, this super-steamer will be able to make a transatlantic trip in 3½ days.



It will take a dog team such as this one eighty-two days to make the trip from Juneau to Nome, Alaska. However, old timers do not remember when such a trip was undertaken—the eighty-two days is their estimate. Today an airplane makes the trip in two days with an overnight stop at Fairbanks.

Flying the Arctic

By Henry W. Roberts

In two days, with an over-night stop, airplanes make the trip which would take a dog-sled eighty-two days to accomplish. However, difficulties still attend Arctic flying; pilots sleep with the oil extracted from their engines and hangars are fitted with defrosting chambers to "thaw" the airplane to freezing temperatures.

Above—A mountain climbing expedition may appear like this on the day following the making of camp for the night. Note skis and tents almost completely covered with snow.

Right—When airplanes first took over the Star Route contracts, Alaskan pilots had to stop at all mail boxes. A flag of dark color was raised at the box as a signal; it would show against the snow-white background and also served as a windsock.

WHEN our Secretary of State, W. H. Seward, bought the Territory of Alaska from Russia for the United States for a mere $7,200,000, in 1867, he made a good bargain for his country. To date,

Photo courtesy Sportsmen Pilot

Eskimos look kindly upon the visits of Father Paul Schulte, who in his Stinson covers vast stretches of territory and ministers to the spiritual and sometimes physical wants of his wide-spread congregation.

Alaskan exports are well over a *billion* dollars, in merchandise and gold. And yet, Alaskan natural resources have but been barely tapped.

A glance at some of the accompanying photographs tells the reason: there, in Alaska, Nature put in man's way all but unsurmountable barriers of rock and ice which hold the country's wealth in their frozen grip.

The lifeblood of a country is its commerce, coursing along the arteries of transportation. In Alaska, its course was torturous and slow. By dog sled and backpack in winter, by sluggish boats in the brief Arctic summer, men and goods moved sluggishly into the forbidden wastes of the Northland. Ten years ago, the first airmen ventured into that

The long shadows produced in the land of the midnight sun create this superb photographic masterpiece of the flying Priest and his Eskimo congregation.

Left — This map illustrates present-day air routes in Alaska.

Spectacular scenes like this unfold before the eyes of the air traveler. This is a glacier in a mountain in British Columbia. The photo was taken by the Royal Canadian Air Force.

land of snow and desolation, bringing with them their frail small ships — and overnight the country's pulse beat faster.

Ten years went by — and today airplane is the Arctic's principal method of transportation. They carry men and gold to the outposts of civilization, and beyond, in as many hours as it formerly took days. They speed help and succor in emergencies. They carry mail to faraway camps and settlements. And, sometimes, they are themselves lost in the grip of the North — and another grim chapter is written in the history of that cold and inhospitable land.

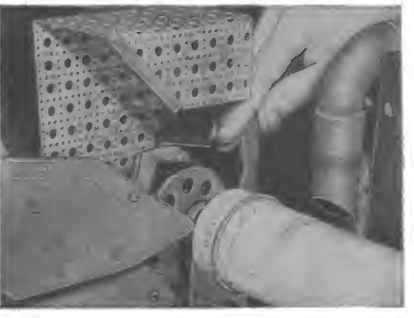
(*Continued on page* 82)

At Fort Simpson, we find the Arctic Airmail planes on skis and ready for instant service.

Right — Noon at Fairbanks, Alaska. While there is a sun in the sky, it is so near the horizon that store windows and street lamps are illuminated all day long.

Sending a Kiss by Wire

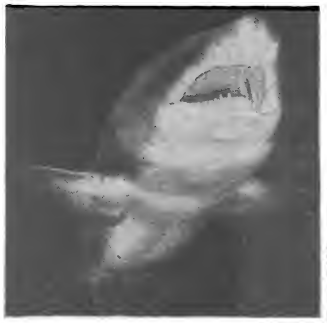
Transmission of facsimiles put to surprising use.



NO sooner does a new scientific development startle the public than some lovelorn swain decides to apply its principles. Not so long ago the Western Union Telegraph Company announced the perfection of a method of transmitting facsimiles by wire. This gave Miss Mary Bodmer an idea; on St. Valentine's day, she applied the lipstick judiciously, kissed a telegram blank and sent the message to her sweetheart in Chicago. A girl on roller skates rushed the "hot" copy to the transmitting desk where the paper was put on a roll and in one minute its reproduction appeared in the Chicago office. No doubt as the boy friend pressed his lips to the paper, he muttered "but the old way was so nice."

Try Shark Rodeo for Sport

IF you would like the thrill of a lifetime, you could probably get it by attempting to ride a shark. Boys along the Florida Keys, ranging in age from fifteen to twenty, find this a great sport. Slipping silently up to a so-called nurse shark lying in shallow water (where these monsters go to breed), one of the boys in the rowboat leaps overboard, grasps the large pectoral fin of the shark and goes for a joy-ride for about a minute. His companions in the boat start the motor and trail the stream of bubbles. Older men thrill to wrestling with sharks.



Sharks do not turn on their backs to seize their prey. This is the way a shark opens his mouth to take the bait.

Right — Attempting to hold the shark's jaws closed. Note heavy gloves worn by the swimmer. Extreme right — The shark is rolling over; this will dislodge the swimmer who floats to the surface and is picked up by the boat crew.

Paralyzed with Fear?

You can stand a crayfish on his head in the manner illustrated in the photograph at the left if you employ the methods described in the text. **No hypnotic power is necessary.**

To perform tricks with the crayfish, put it on its back as shown below, spin it around several times and it will become immobile.

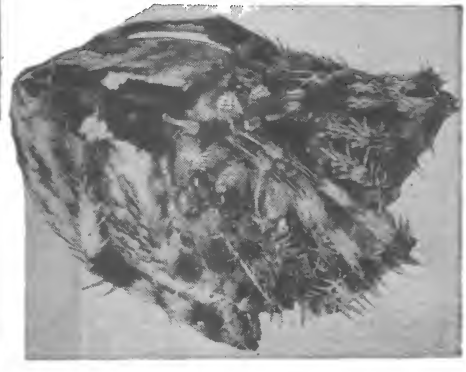
NO doubt we have all seen the stage hypnotist demonstrate the seemingly miraculous power of his hypnotic gaze upon animals and human beings. Those of us who have experimented with hypnosis, know how much the willingness of the subjects counts for producing a true hypnotic state. While such demonstrations inspire wonder among uninitiated audiences, even admitting that some of the reactions are faked, their effectiveness is multiplied greatly when the hypnotist employs animals as his subjects. The audience knows that the animal cannot be trained to do some of the things which the hypnotist commands be done. Hence the results become surprisingly convincing.

Strangely enough, animals are easily "hypnotized" and there is no

Right—A lizard, when rolled over on its back, will remain rigid in this state as if dead. It will not move until all danger is passed.

At the slightest sign, the beetle (Elateride sp.) feigns death as shown below. When fear of danger is passed, it snaps its body and leaps into the air.

If this spider (Araneus diadematus) is touched, it draws itself into a ball and falls to the ground. In the grass, it is scarcely visible.



Are these spectacular stage presentations of hypnotic powers on animals demonstrative of hypnosis— or is it fright?

need for a pair of hypnotic eyes, a penetrating gaze or the mesmeric passes of the hypnotist's hands—and at no time is the effect hypnotic in nature. What actually happens is that the animals apparently are paralyzed with fear —frozen stiff, so to speak, and they do not move until disturbed.

Many of the older books on hypnosis explain how a chicken can be "hypnotized." The instructions given are that the legs should be folded against the body, the chicken should be set down upon the table, the head to be grasped with the other hand and pressed down so that the beak touches the top of the table, while the neck should be stretched slightly; then a chalk line should be run out from the

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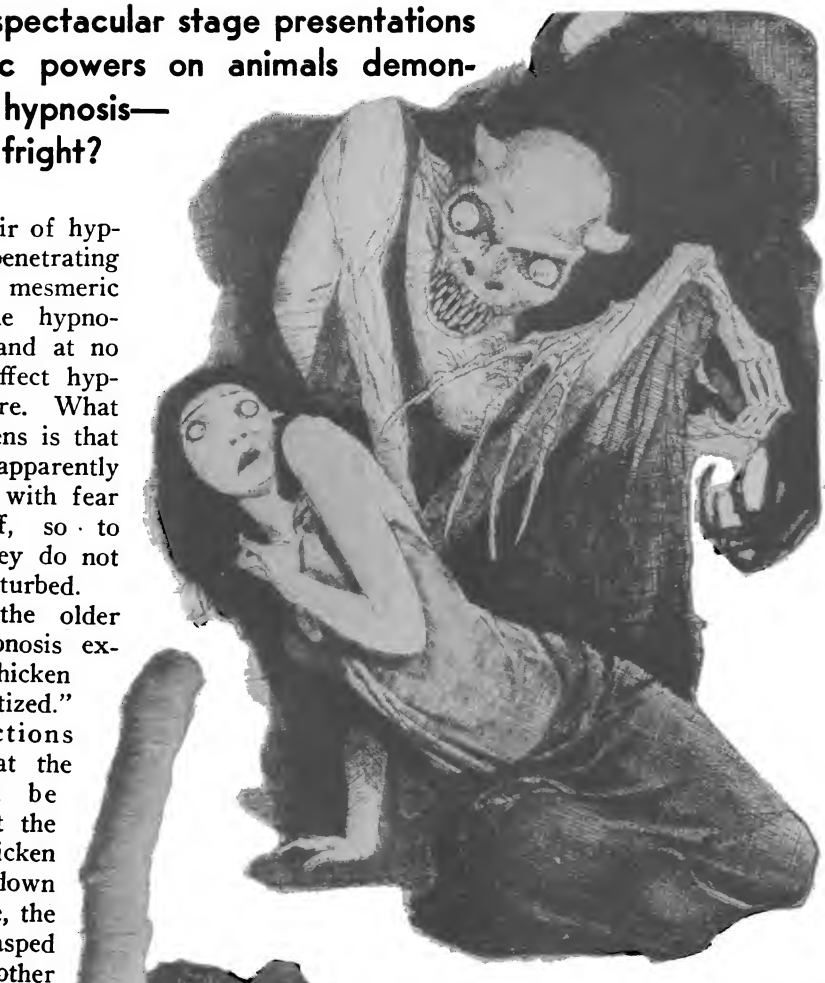
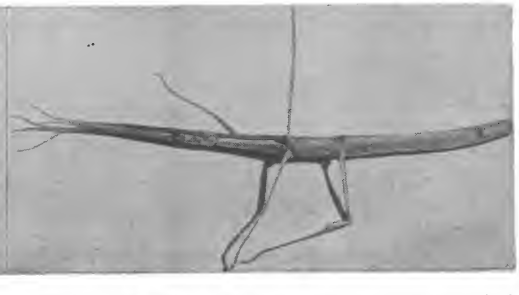


Above — For the program jacket, "The Selwyns present the Grand Guignol players" (1923) artist Hans Flato prepared the above, depicting terror.

Right — This caterpillar, at rest, resembles a dead twig.

The walking stick, an insect, scarcely needs to adopt a death-like attitude; it resembles a twig.



When the walking stick is tossed to the ground, it assumes a lifeless pose.

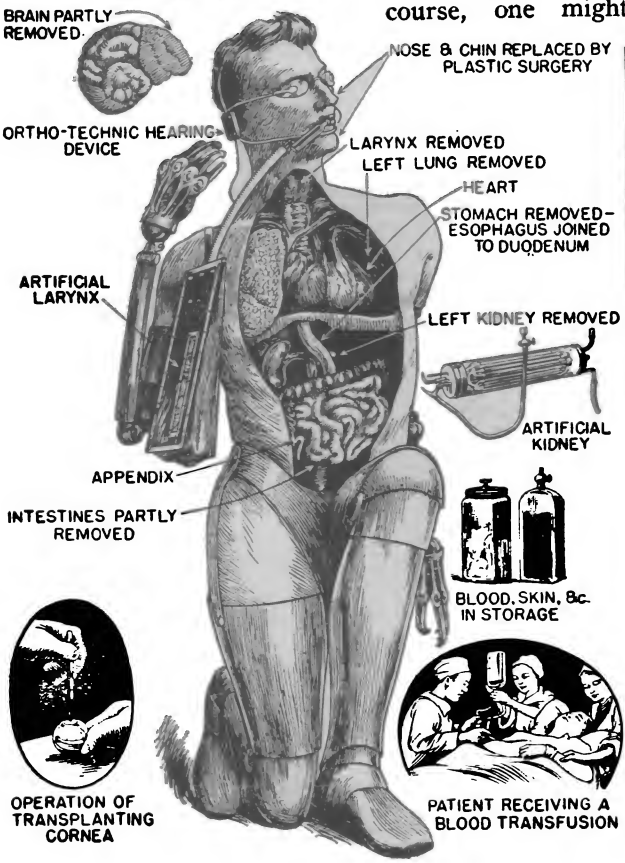
Man Nears *Automaton* Era

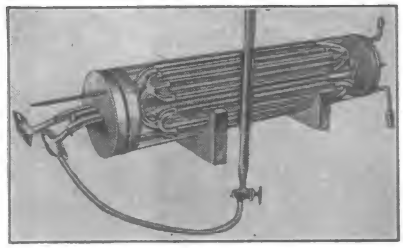
Mechanics and science aid in rebuilding the human body.

Photo Western Electric Co.

This is the artificial larynx which consists of a bellows and a voice box. With it, those who have no vocal cords can talk.

WHEN one stops to consider what is necessary to maintain human existence, one becomes amazed at the many organs of the body which could be eliminated entirely without causing the loss of life. For example: It is conceivable that a man could live without eyes, nose, mouth, teeth, tongue, ears, without a larynx, pharynx, stomach, a good part of the intestines, gall bladder, one kidney, spleen, appendix, arms, legs, and many glands, including the thyroid, thymus, gonads, and with a good portion of his brain removed. Of course, one might cry, "who would care to



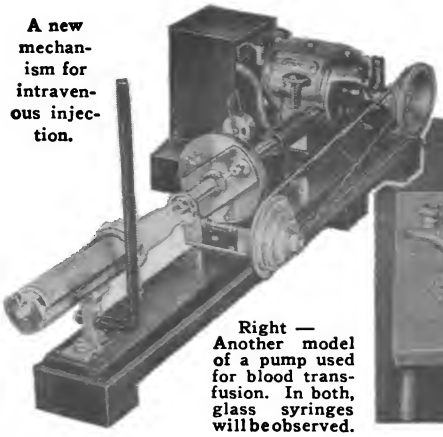


Dr. John G. Abel, M.D. of the Laboratories for Endocrine Research, Johns Hopkins University School of Medicine, furnishes us with this earlier form of artificial kidney; urine is eliminated from the blood circulating through the tubes.

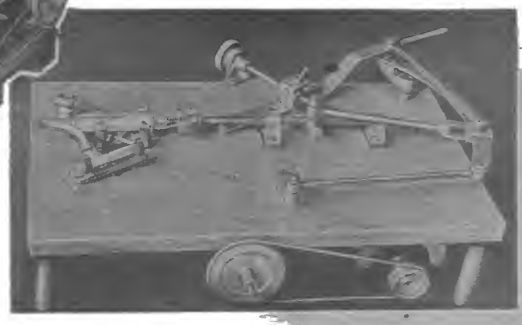
Part of the operation for the transplantation of the cornea from the eye of a dead person to that of a living being. When the operation has been completed, the living person's sight will be restored.

Left — This illustration shows, schematically, the many parts of the body which could be removed while life still continues. It further proves that nature was quite lavish when she distributed organs.

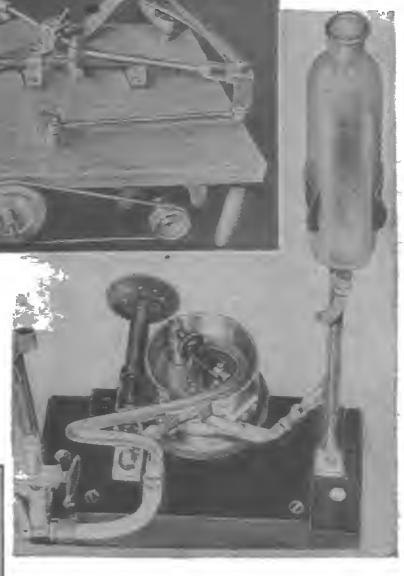
Many of the organs of the human body could be dispensed with and yet the person could continue to live for many years.



A new mechanism for intravenous injection.



Right — Another model of a pump used for blood transfusion. In both, glass syringes will be observed.



A glorious modification of an old principle—a pump which uses no valves and which depends upon pressure against a rubber tube by a roller. (See diagram in the continuation of this article.)

live in such condition," but one of the first laws of nature is self preservation. Modern surgical science tends to uphold that natural instinct. Furthermore, a man bereft of all these anatomical parts might become fabulously wealthy purely because he would represent a circus side-show attraction second to none.

Meanwhile, science is attempting to make the body

Plaster cast with zippers are the latest innovations. By this means, one can observe the progress of healing. See photos below.

rely more upon mechanical substitutes for nature's organs. Experiments are now being conducted, not only in this country, but also abroad to produce an artificial heart to stand up under the most trying conditions. Of course, it is difficult to conceive of any mechanical pump which can stand the wear and tear to

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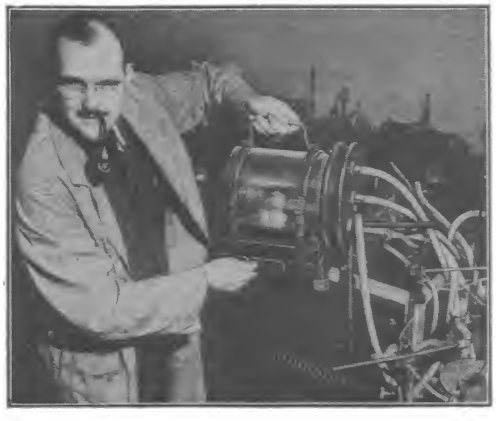
This shows the zipper applied to a plaster cast on the leg. The cast can be removed or put back in place instantly and holds just as firmly as a solid cast.

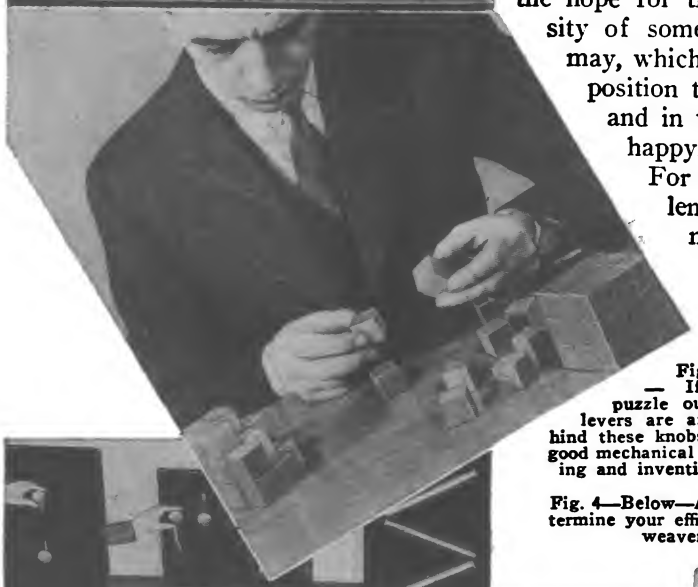


Right—Dr. Maurice Visscher, head of the Department of Physiology, University of Minnesota, is pictured here with his apparatus in which life in heart and lungs is maintained even outside the body.

Machines Decide Your Career!

Fig. 1—This test determines manual dexterity.

Fig. 2 (Below)—Playing with children's blocks determines your constructive ability.



THE importance of a wise choice of occupation scarcely can be over-estimated. The consequences both to the individual and to the community of a vocational misfit may be extremely serious. The careers of most workers have been chosen as a result of following the suggestions of chance acquaintances—having become inspired with the success of some fellow student whose work became the hope for the future—or the necessity of some work, be that what it may, which drove the worker into a position to which he is not suited and in which he certainly is not happy.

For a long time, these problems have occupied the minds of eminent psychologists. One of the main causes of human

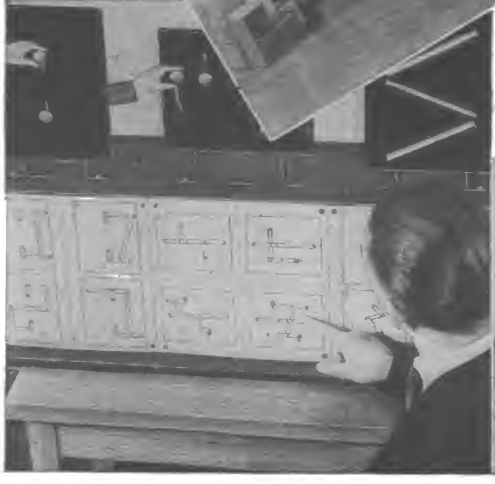


Fig. 3 — Left — If you can puzzle out how the levers are arranged behind these knobs, you have good mechanical understanding and inventive ability.

Fig. 4—Below—A test to determine your efficiency as a weaver.

Various mechanisms show the work to which you are best fitted and in which you are most likely to be successful.

unhappiness is to be in the wrong job. Under modern conditions it is not so easy to change occupations, particularly not after a certain age has been reached. But when a man is in the wrong job it not only affects him adversely but will also have dire consequences upon those subservient to him but better fitted to carry on the work. Furthermore, a happy worker, even though he is not highly salaried, does not spread discontent among his fellow men.

Take, for example, a person who has been with an organization for twenty or thirty years and not because of ability but rather because of politics and length of servitude, he achieved a position of prominence with his organization. He does not look kindly upon suggestions for improvements, he does not listen to logical recommendations for increasing profitable yields. He has no vision for further developments or new products. His helpers could be of benefit to the firm, and might be able to increase the output or develop new products, but they are thwarted in every attempt; soon they offer no further suggestions and accept conditions as they are until such time as they can switch to a more progressive organiza-

Fig. 5—This machine is designed to determine your mechanical aptitude. You can examine it to your heart's content. Questions are asked afterward.

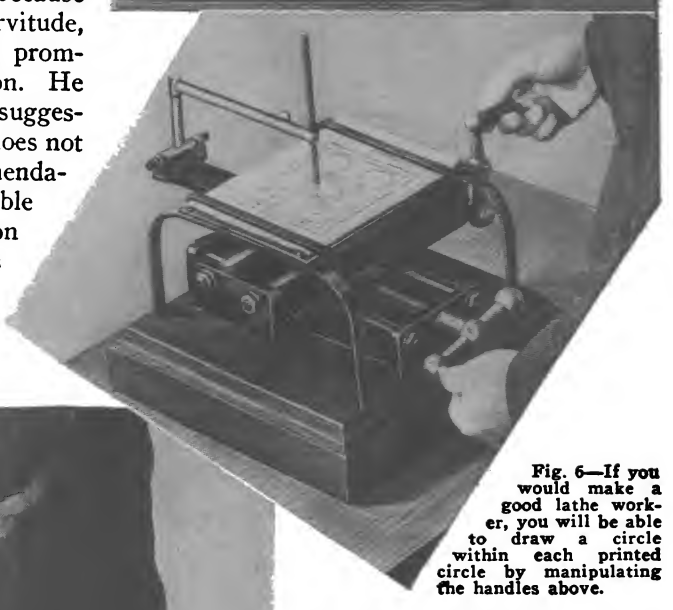


Fig. 6—If you would make a good lathe worker, you will be able to draw a circle within each printed circle by manipulating the handles above.

Fig. 7 — Straight lines with a soldering iron indicate your ability as a tinsmith.

Fig. 8 — How quickly you will respond to technical difficulties which may arise, is determined by this mechanism. You must dot every point that is out of line.

Fig. 9 — If you would be a good seamstress, you must follow the printed line on the paper ribbon.

tion. For these reasons, psychologists—and industrialists—are anxious to employ the right man for the job.

Science has devised many mechanical contrivances with which one can obtain a more exact estimate of a person's ability than could possibly be achieved by casual observation or interrogation. Many vocations are now trying to apply these self-same mechanisms to serve as a final indication of the fitness of a person for a certain job. Not only will this elevate the standard of the industry itself, but it will also benefit the applicant in that he will not be a round peg in a square hole, or vice - versa. Scientific instruments have been developed which can advise ninety-two out

(*Continued on page 87*)

Fig. 11 — Polishing is done quicker on this work bench arrangement.

Fig. 10 — Minor changes in bench design and working conditions for celluloid brush polishers relieve fatigue and increase production.

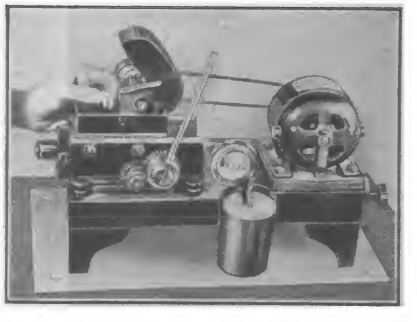
Getting Stung by Bees!

Latest researches proclaim this method to be ideal for the treatment of rheumatism, alcoholism or neuralgia.

ACCORDING to reports reaching us from Germany, the latest method of treating rheumatic patients is by giving them a daily dose of from two to sixty bee stings. The bees for this purpose are kept in dark cages, and just before release, are irritated. They then sting anyone upon whom they alight. Prior to the treatment, the blood of the patient is examined in the laboratory, and a constant check on the result of the treatment is maintained. American doctors scoff at this method. It was known to the ancient Greeks, even being employed for Asiatic cholera; in the seventeenth century, bee stings were used for rheumatism.

Slicing Teeth for Microscopic Study

THIS small instrument, constructed in the laboratories of the University of Minnesota, is a tooth slicer which cuts a tooth into sections. Six emery wheels running in water do the cutting, a weight presses the tooth against



the wheels constantly. The tiny slabs, so produced, later are ground and polished and then mounted for microscopic study. For such work it is, of course, imperative that the sections be transparent —thinner than paper.

Beam Lights — Air Raid Safety Factors

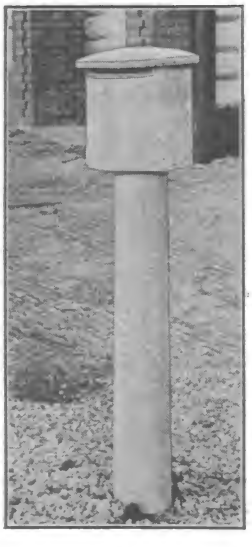
This signal gun has a range of four miles. Messages can be sent with it.

New invention introduced in Holland, employs thin shafts of light which are completely invisible from airplanes, yet offer sufficient illumination for motor-vehicle and pedestrian traffic.

The lamps with the bonnets produce "invisible" light.

A street post.

EVERY city in an area likely to be attacked from the air turns off all lights and plunges the territory into darkness. As a result, many accidents occur and neither anti-aircraft forces nor ambulances can move with safety. Amsterdam, Holland, is now being protected by "invisible" lamps, invented by Capt. J. Bikker. These lamps throw a restricted beam of light which is visible only to someone directly in the path of the beam. Street corner lights are small pin points. Nevertheless, illumination is sufficient to permit of operation of automobile and traffic signals. At no time can any of this light be seen above a height of eighty yards. This is much too low in altitude to permit of safe operation of aircraft. As a result, aircraft miss their marks.



Left — A guiding lamp for motor traffic. These lamps are placed along the road every thousand feet.

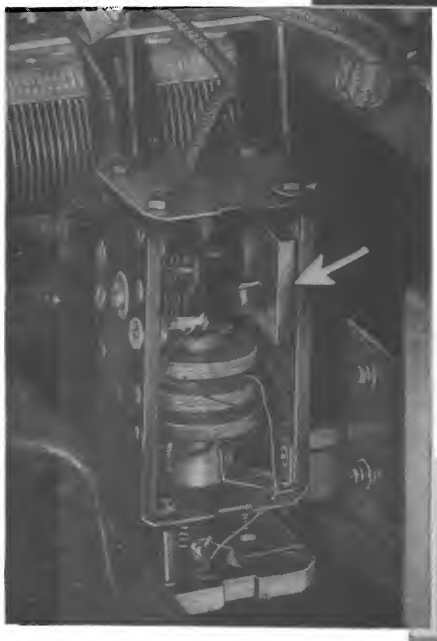
The rays from the lamps are invisible yet the automobile ahead is sufficiently illuminated.

Wedge-shaped Crystal Perfects Radio Reception

High fidelity broadband reception possible in overcrowded wavebands without interference from stations in adjacent channels.

Fig. 1 — Alexis Guerbilsky holding a wedged-shaped crystal which permits of sharp tuning without cutting sidebands. Left—The crystal (Fig. 2).

EVERY radio enthusiast knows that tuning circuits controlled by crystal have an extremely sharp resonance characteristic. This valuable means to increase the selectivity is used in telegraph receivers to "cut-out" any station desired from an overcrowded waveband — without interference by transmitters operating in adjacent channels.



If we consider the overcrowded condition in any part of the short-wave and broadcast band one wonders why this so desirable means to increase selectivity has not been used for broadcast reception.

The reason for its exclusive use in telegraphic communication is the well-known fact that crystal controlled tuning circuits have a very narrow frequency characteristic, *that is, they suppress the low as well as the high frequencies, but distort music and speech.*

This disadvantage of crystal-equipped tuning circuits now has been eliminated by a surprisingly simple system invented by the French engineer Alexis Guerbilsky of Paris.

(*Continued on page* 81)

Fig. 3 — A slightly changed I.F. transformer with inserted crystal.

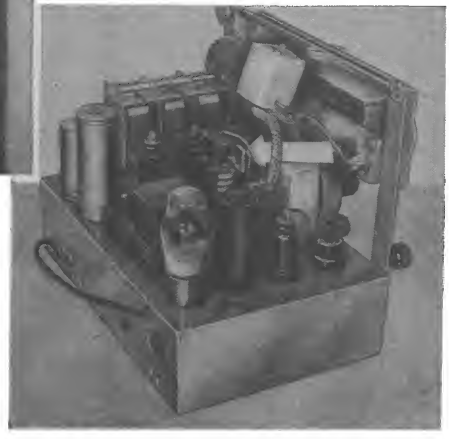


Fig. 4—Right — Selectivity of this American set was increased five times by using the principle described.

"Etiolation"

A most practical method of making stem cuttings from apple trees and similar hard-to-root woods, discovered by scientist.

Left—Applying black paper bags before growth starts. In these bags, the growing shoots remain white and tender.

Above—Method of taping growing shoots of apple trees.

Right — Etiolated condition of the shoots from which the black bag is removed; (left) as compared with the normal shoot (right).

IT is a well-known fact among orchardists and expert horticulturists that stem cuttings of apple do not root to any appreciable degree by the procedure similar to that usually employed in making cuttings of many other plants.

For some years Mr. F. E. Gardner of the U. S. Department of Agriculture at Beltsville, Md., has been experimenting in the rooting of apple cuttings and, to this end, has tried many methods and treatments. His report on the success of his discovery will be welcome news to many apple growers and others interested in horticulture.

Mr. Gardner calls his method "etiolation," a condition resulting from growth in complete or nearly complete absence of light, which is, to the average mind, a condition entirely contrary to the natural laws of plant growth. Mr. Gardner him-

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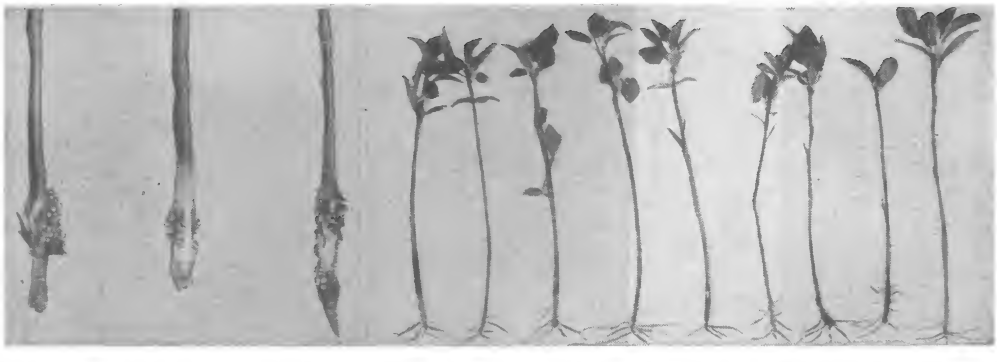
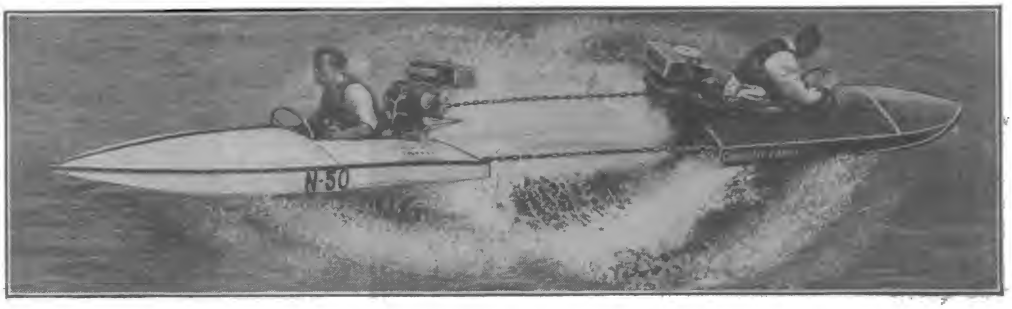


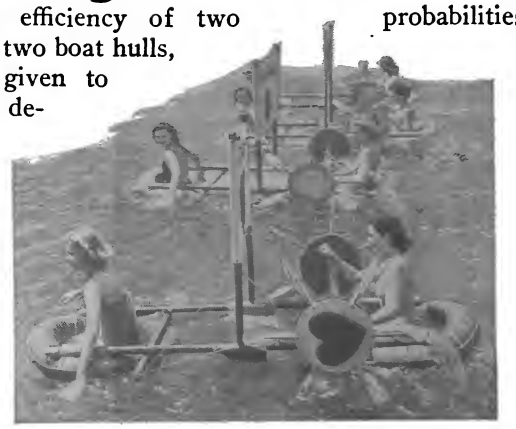
When tape is removed, Northern Spy shoots show an advanced stage of root primordia.

Rooted cuttings of McIntosh apples two weeks after being placed in propagating bed. The shoots made their initial growth under a black hood and were later taped.



Testing the Outboards

THE comparative efficiency of two outboard engines, two boat hulls, or the adjustment given to spark and gas can be determined without the use of expensive apparatus. The two boats are connected together as illustrated above (the distance should be determined by experiment). First one engine and then the other is started up and the tug-o'-war ensues. The probabilities are that a slow movement in one direction will take place. The outboard motors now are transposed and the same experiment tried. If the boats move in the same direction as before, then the hull of the forward-moving boat is better. If the boats move in the reverse direction, one can determine relative values.



These small inflated craft, operated by paddle wheels and helped by a square sail, recently made their appearance at Miami, Florida. Two automobile tires, a few sticks and individually cranked wheels complete the equipment.

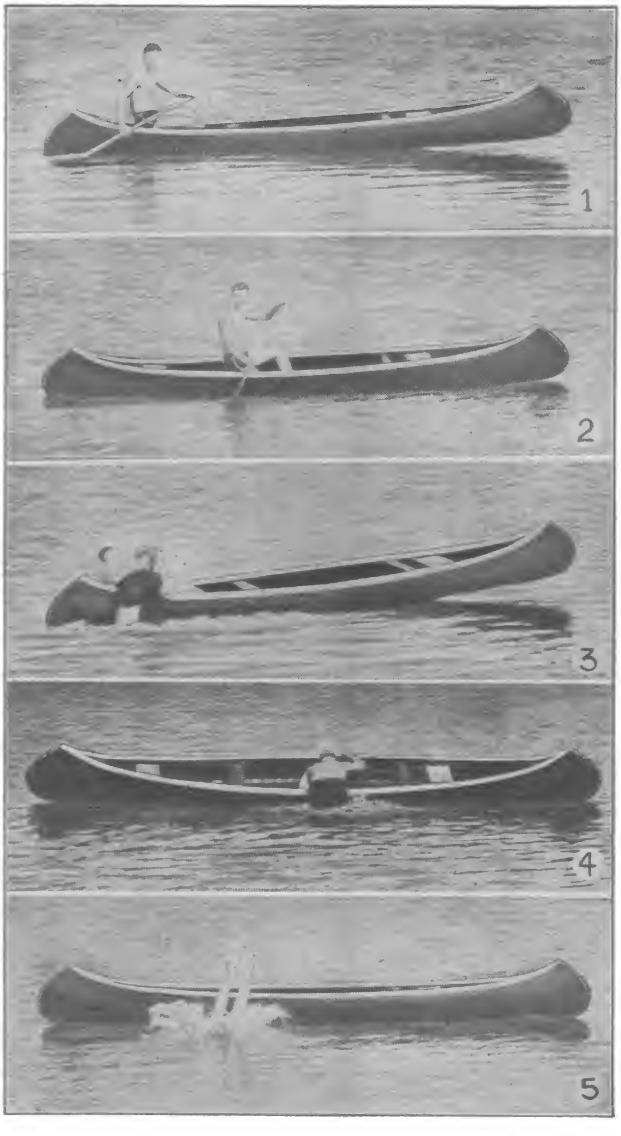
John Law Photographs You Speeding — Oh Yeah?

TO prove that you have violated the traffic laws, a camera has been mounted in a police car to "snap" the back of the speeding auto, the front of the police radio car, and a speedometer at one time. The illuminated speedometer is attached to the front of the police car as shown in the photos below. This method gives inconclusive evidence. Using the same equipment, the cops could "prove" that every tree, or telegraph pole is speeding—"it's all on the photograph."

The photograph "proves" that you were speeding.

The overhead camera produces the "evidence"—inaccurate to say the least.

Handling a Canoe



It is a good idea to familiarize yourself with the handling of a canoe so that it will be quite as safe as a rowboat. Do not assume the position shown in photo 1. A gust of wind could upset the canoe easily. For ordinary work, a better position is illustrated in photo 2. A good way to get back into a canoe from the water is illustrated in photo 3, but heavy people—and those not so spry—can use the method as shown at 4. If this is worked carefully, you will not fall out again at the back lurch as at 5.

By Edward F. Waldron

AS a sample of seaworthiness of small boats, the San Blas Indians sail boats that are really dugouts — shaped like a canoe and from 25 to 30 feet long but never over 3 feet wide—from the San Blas Islands to Colon, Panama, a distance of 140 miles, with loads of ivory, nuts, bananas, cocoanuts, or pineapples and two to four people regularly in all weather. They can be seen coming in with a load through the breakwater when the larger vessels were staying in port because the weather was too rough! Yet every day in the summer we hear of canoeing accidents!

Let us analyze our canoe a little. This boat is extremely light and the seats are in the ends. If we sit on the seat on one end, the other goes up in the air. If we wriggle or lean over, we fall out very easily. Suppose we put another person in the bottom of the canoe with a back rest or cushion and notice what happens. The bow does not rise as much as it did. We can lean over much farther before we are off bal-

Probably the most abused and most misunderstood boat is a canoe. When handled correctly, however, and loaded properly, it is the most seaworthy boat of its size in use in the world.

With a little practice, it is not difficult to handle a canoe in this fashion but the stunt is not recommended to beginners and certainly not to those who cannot swim.

ance or the canoe tips. We have learned that a canoe behaves differently with different loads, and that a load in the bottom steadies the canoe. If we bear this in mind, and avoid the high load that one gets when sitting on the seats, the first step in the idea of stability is developed. In other words, when alone in a canoe, never sit full weight on a seat. Kneel on one or both knees in the bottom, resting against the thwart, but not really on it.

If you are paddling along, sitting on the seat as in Picture 1, and the wind starts to blow, how will you stay on your course? Some people sit right there and paddle backwards all the way home. Others go ashore and get a big stone to put in the bow to hold it down. Both of these schemes are land-lubber devices; because the seats are there, they seem to think that is the place from which to paddle a canoe. By the same reasoning, they should conclude that since there are two seats, there should be two paddlers. That is logical reasoning and I should like to add that unless there are two paddlers of approximately the same weight, the seats of a canoe never indicate the paddling station. Note in Picture 2 how the canoe flattens out when the paddler moves up to the cross brace. If the wind blows, he can get down on both knees instead of one, and put his back into the paddle. If he still has trouble keeping the bow on its course because the breeze is so stiff, he can move forward on his knees some more until the proper place is reached. One person, then, can paddle home in a gale of wind if he will move to the right position, where his paddle stroke

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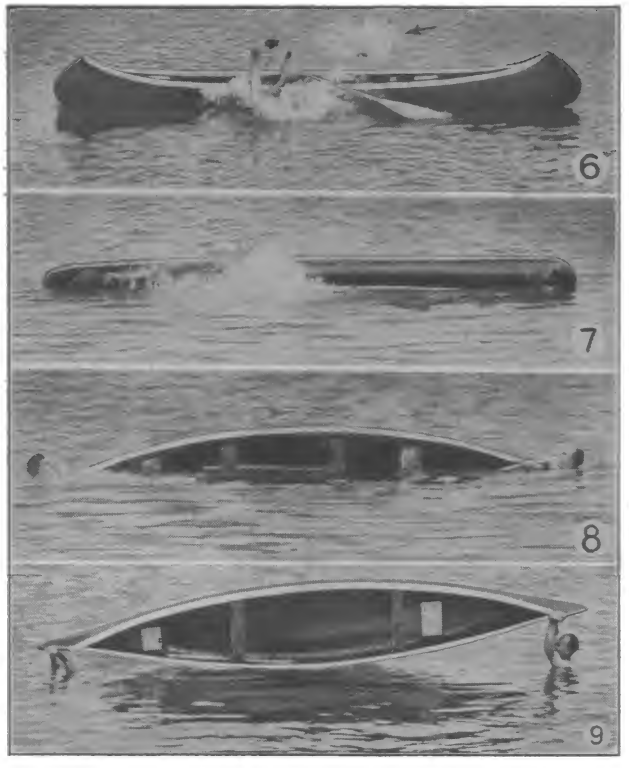


In photo 6, a person has fallen out on the far side of the canoe as illustrated by the arrow. In his effort to right the canoe, the back lurch suddenly catapulted the other canoer into the water. The two people can hold onto the canoe until help arrives, if they do not know how to swim, but if they are somewhat familiar with water sports they can turn the canoe over as shown at 8 and, treading water, raise it, dumping most of the water from the craft as shown at 9. The next action is given on the previous page.

Make a Pontoon Sport Boat

A sailboat similar to the one described here was designed and built by Dennis Milner. His craft employs a "wishbone" mast from which the sail is slung.

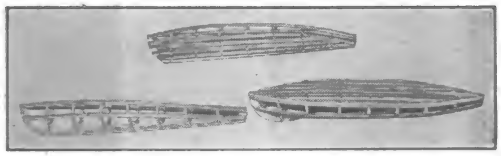
This is a collapsible boat and a lively craft that you can pack on top of your car and carry with you. Each pontoon will weigh less than 25 pounds. When made according to directions, the entire outfit can be taken apart with a single wrench and reassembled. The assembly should not take you over fifteen minutes at the most even if you take your time. It packs well, and will prove to be lots of fun.

THIS boat is built on three pontoons, each of which are exactly alike. Proceed therefore to lay out your ribs from the half ribs shown in Fig. 3. They are built as shown in Fig. 4 of ½" thick white pine or spruce. Make three of each rib, be sure to notch the bottom of each rib so that the keel can be set in part way allowing it to protrude ½". Now cut out the stem pieces and the keels. At No. 8 station the rib is a straight piece of ¾" wood.

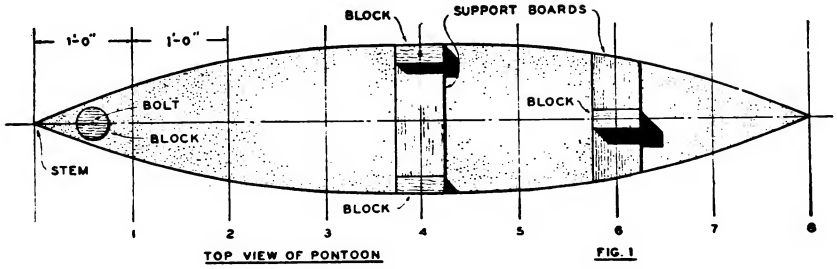
Now begin the assembly. Nail a ¼" batten to the center top of each rib spacing these ribs one foot apart. Next turn over and fit in the keel and stem in the bottoms of the ribs, nailing in place, then fit the stern which is a straight board.

Nail on two more deck battens and then begin to nail on the side battens: three on each side, three on each half of the bottom, and five on the deck. The pictures show this construction very well. If any question comes up, refer to MECHANICS AND HANDICRAFT — March, 1938: Shoes for Walking on the Water, and follow the details there.

When the battens are all on, trim them smooth and round off all sharp edges with a plane so that they will not cut the canvas. Cover these pontoons



The view of the pontoons ready for their cloth coverings.



TOP VIEW OF PONTOON

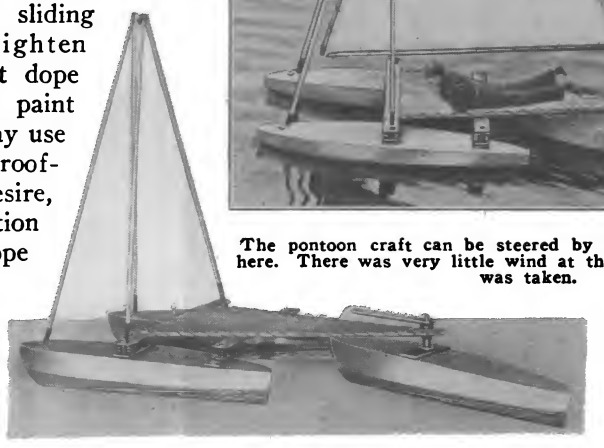
FIG. 1

The top of each pontoon will appear as illustrated in the diagram at the left. There is a slight modification in the fittings for the rear pontoon.

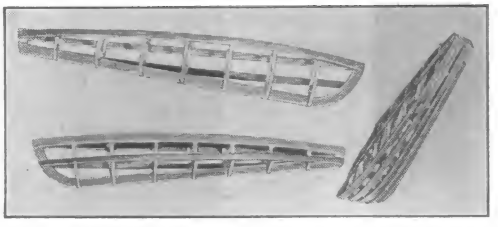
This craft might be characterized as an ice-boat on floats. It is completely collapsible and could be used with a light outboard motor. It is ideal for reaching those out-of-the-way fishing places to which a canoe could be portaged with difficulty only.

The pontoon craft can be steered by the feet as illustrated here. There was very little wind at the time this photograph was taken.

with 10-oz. drill stretching and tacking the canvas on while dry. Next finish the pontoons very carefully with airplane dope—1½ gallons will do the whole job. With long screws attach to the keel the keel pieces which are necessary with this boat to keep it from sliding sidewise. Tighten down into wet dope or paint and paint them. You may use paint as waterproofing if you desire, but an application of airplane dope first is recommended, then you may paint over that. Leaks are readily taken care of on pontoons treated with airplane dope, but may prove very stubborn on a painted pontoon. You are now ready to mount the support boards on the pontoons. Make a 6″ board for each pontoon to go exactly over the No. 4 rib. Now cut four pieces of 2″ x 3″ wood 6″ long; bore each of these for a 5/16 bolt. Drill a larger hole in the bottom and draw the bolt nut into this hole. Pack each nut in tight with plastic wood. Screw two of these blocks firmly to each of

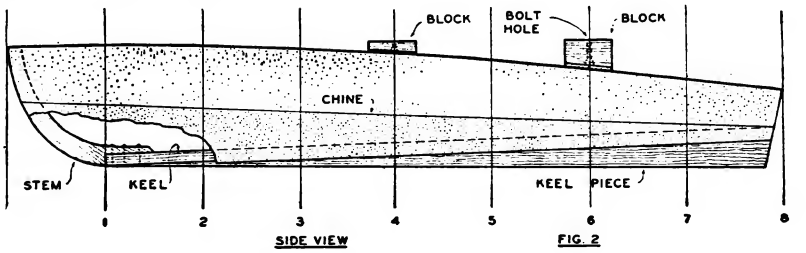


How the sport boat appears when on land.



Another view of the frames for the pontoons is shown above. Compare with diagrams below.

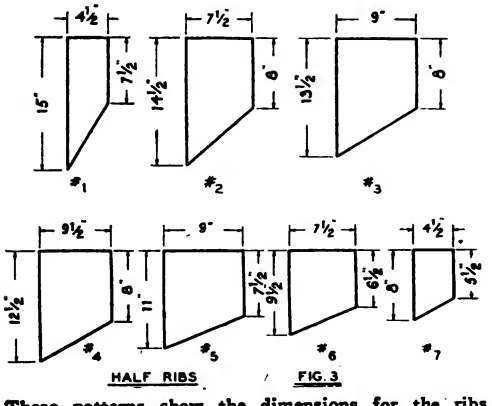
The general curves and shapes of pontoons are indicated in this side view. Note the keel piece attached to the keel. This is essential; without it, the vessel would slip sideways.



SIDE VIEW

FIG. 2

With a stiff breeze, one pontoon will rise out of the water while the other is awash.



HALF RIBS FIG. 3

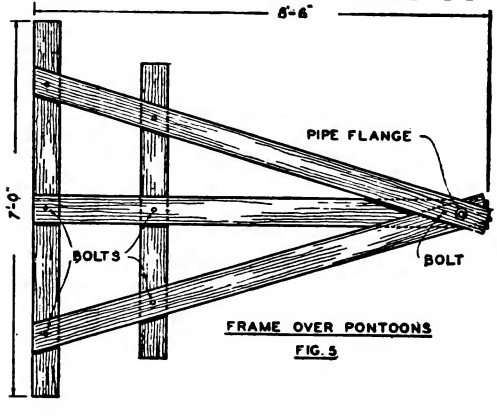
These patterns show the dimensions for the ribs at the various station positions indicated in Figs. 1 and 2.

This frame is made so that it can be taken down by loosening a few bolts. When folded the item is transported easily in the car. (See diagram at right.)

two of these support boards, and fasten these onto two of the pontoons by screwing them firmly to the deck on top of No. 4 rib.

Make two blocks of 2" x 4" wood with a piece of ¾" board nailed on top of that so that they measure 2" x 4¾" x 6". Set nuts in them as before and mount on the center of two 6" wide boards cut to fit over the No. 6 station. Then screw these blocks to these same two pontoons. Now make the cross-board shown in Fig. 7 and lay across the center of your pontoons and fasten in place with bolts through the blocks and into the nuts set in these blocks.

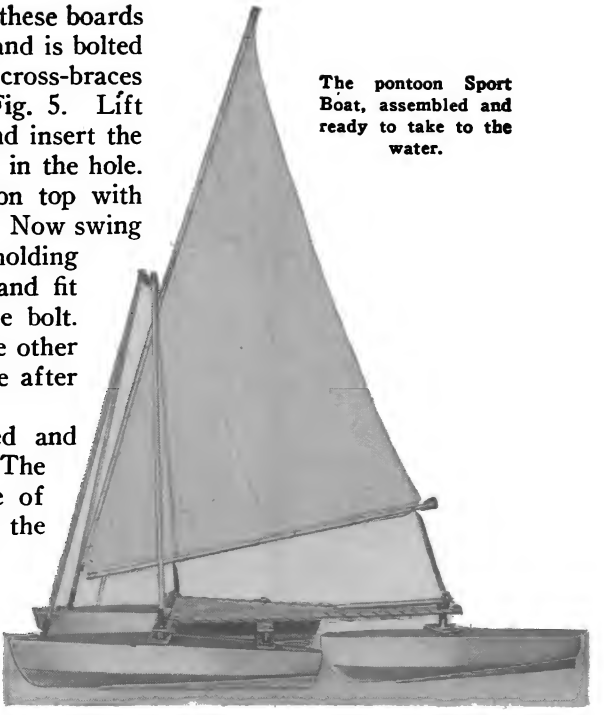
Next fit the second cross-board to the 2" x 4¾" blocks and bolt in place. This board is not reenforced as is the other one. It is simply a plain 6" board. Now for the steering pontoon. On the support board for this pontoon mount in the center with bolts a pipe flange to fit 1¼" pipe and fasten the board firmly in place on top of No. 4 rib. Next take a 14" piece of 1¼" pipe that is threaded four inches and bored at the other end for a 5/16 bolt and screw on a pipe flange so that the flat side is toward the unthreaded end of the pipe. Screw this flange on tight; put on a lock nut and set it tight. Next start another nut and screw the pipe into the pipe flange on the pontoon and lock it in position with a lock-nut. Take three of the 9 foot boards 6" wide; hold them in a vise and at one end bore a hole for the 1¼" pipe



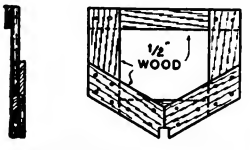
FRAME OVER PONTOONS FIG. 5

six inches from the end. One of these boards can now be cut to 8½ feet long, and is bolted to the centers of the two cross-braces mounted on the pontoons—see Fig. 5. Lift up the other end of this board and insert the pipe post on the steering pontoon in the hole. The other two boards are laid on top with the pipe through the hole in them. Now swing them out and remove one bolt holding the cross board to the pontoon and fit one of these boards to that same bolt. Do the same with the other on the other side, then bolt these boards to the after cross-brace as per Fig. 5.

A third pipe flange is reamed and screwed down to the top board. The tiller is then made from a piece of 1¼" thick wood and fastened to the top end of the pipe with a bolt passing through it and the tiller.

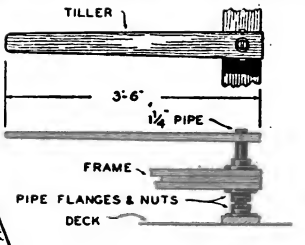


The pontoon Sport Boat, assembled and ready to take to the water.



TYPICAL RIB FIG. 4

The completed rib will appear as shown in the above diagram. Get dimensions from Fig. 3.



TILLER FIG. 6

Above — Side view of the finished craft; and left, tiller arrangement which attaches to the rear pontoon.

PONTOON SAILBOAT FIG. 8

Since no mast is used, four stick stays become necessary. These are tapered from the 1½" square stock to 1" at the ends. They are of two lengths. Those forward are 10 feet long. The ones on the cross-board are 9 feet four inches long. Straps are put around the top ends with holes bored for a bolt and all four are bolted together at the top. A ring is hung from this bolt for hoisting the sail. The bottoms are held by foot eyes bent out of ¼" iron rod that has been pointed at the ends. These ends are bent over and pressed into the sides of the

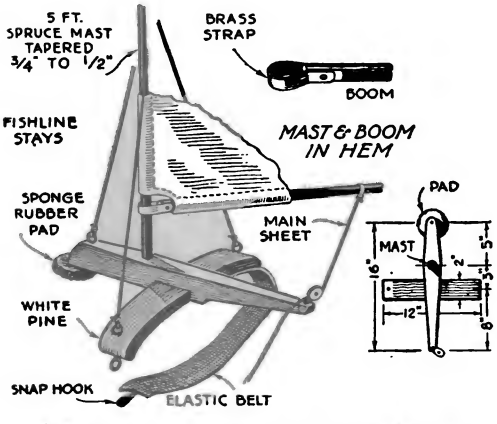
(*Continued on page 75*)

The main spar is jointed at the center, see Fig. 10.

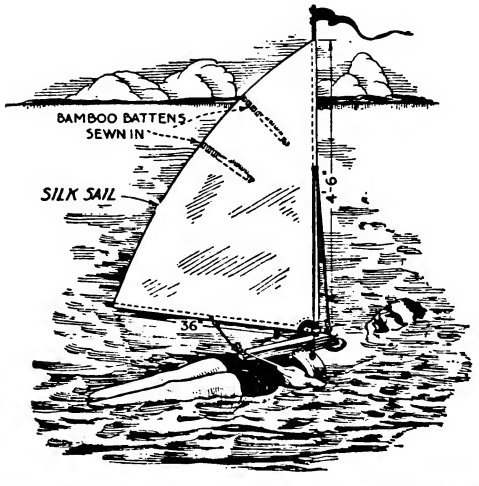
Make This Simple *Swimsail*

This light sail rig, attached to the body makes a yacht of the swimmer.

A modification of the swimsail is illustrated in this photograph. If the swimmer cannot maintain buoyancy, two small floats could be added.



Details for the construction of the swimsail are given here. Make sure that you use a hook which can be released quickly.



In a stiff breeze, the swimsail offers exhilarating sport. The mainsheet is handled with the hand. Steering is done with the feet.

THE frame work of this swimsail is a soft pine or spruce cross-member, steambent, and mortised to a fore and

(*Continued on page* 93)

Shower Bath for Campers

CAMPERS and lovers of the outdoors will enjoy this simple device to give them running water for their shower baths, without the necessity of laboriously elevating water to an overhead tank which would have to be constructed for the purpose and which under any circumstance, cannot be made very portable. The small unit here described is so easily made of a few pieces of wood and odds and ends found in the average home that it will repay the vacationist to build the equipment at his leisure and take it along with him to his summer camp.

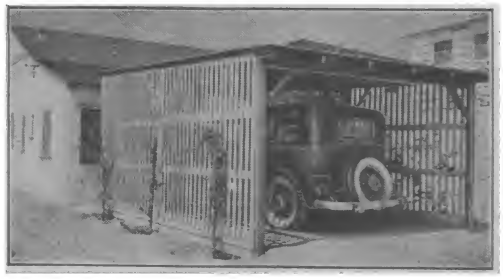
As will be observed in the diagram and in the

(*Continued on page* 92)

Car Shelter *for Cabin*

by Hi Sibley

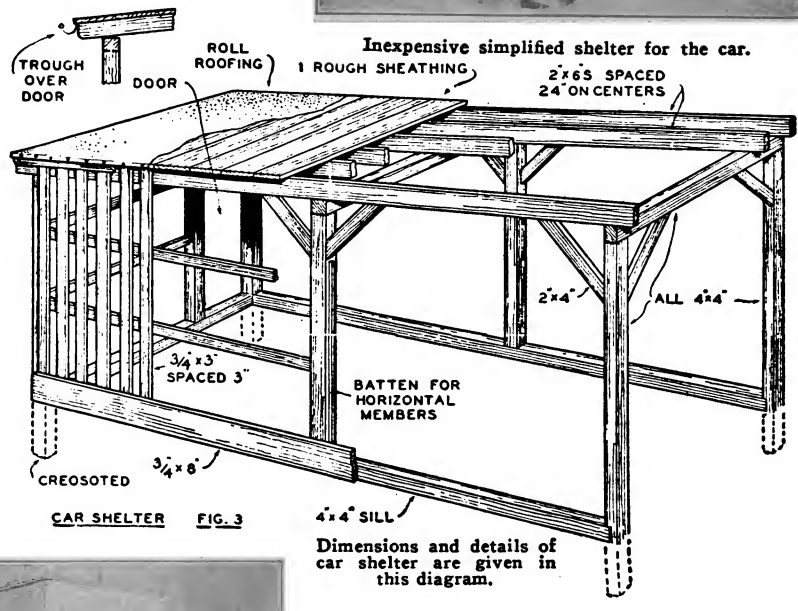
For the summer cottage this attractive, simple and inexpensive car shelter will be found most acceptable. Designed for protection against sun and rain, it also serves as a trellis for flowering vines. It has a wide doorless entrance and is easily accessible from a narrow alley.



Inexpensive simplified shelter for the car.

THIS car shelter is entirely satisfactory for its purpose and is a real asset on a small lot. There is room on either side for a passage-way and a narrow workbench. As vines cover the structure it will give added protection to the car.

Dimensions given are ample



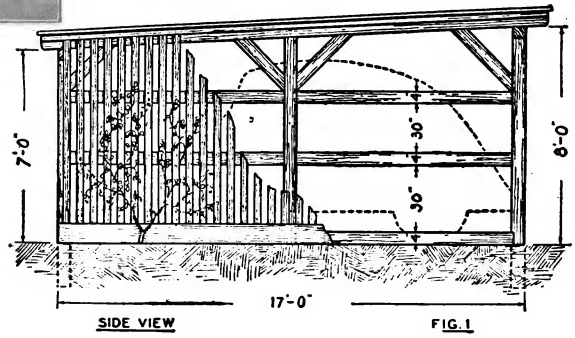
CAR SHELTER FIG. 3

Dimensions and details of car shelter are given in this diagram.

Many beach home-owners at Balboa Island, California, have taken advantage of the inexpensive and attractive features of this type of car shelter.

for a long car above average height. The four corner-posts should be creosoted or tarred below the surface to forestall rot, and the sill could also be similarly treated to advantage. The center posts do not go into the ground, but rest on the sills. The roof in this particular plan has a shallow slope, adequate for roll roofing, but if shingles are used to harmonize with the house a more pro-

(*Continued on page 82*)

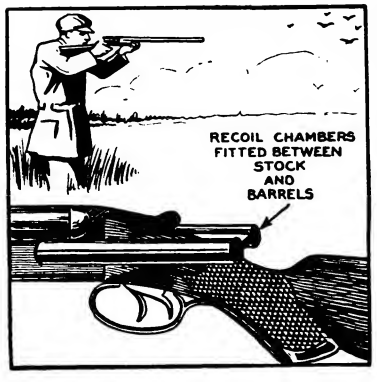


SIDE VIEW FIG. 1

WHAT TO INVENT

Another of the series of articles presenting new problems for inventors.

By Raymond F. Yates



Left — Why doesn't someone develop a pair of recoil chambers which can be applied instantly to any shotgun and which will take up the brunt of the shock whenever the gun is fired.

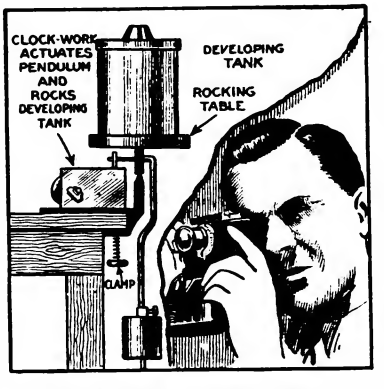
WE have a fine list of needed inventions this month, suggestions for every tyro inventor. Some of the problems have come from manufacturers, some from our readers and some are the result of personal analysis.

We all know that new advances in Diesel engine designs, better television, etc., are needed, but these problems, by and large, are a little too stiff for the average reader. Problems which can be solved on the work benches of modest shops are the prime concern of this department.

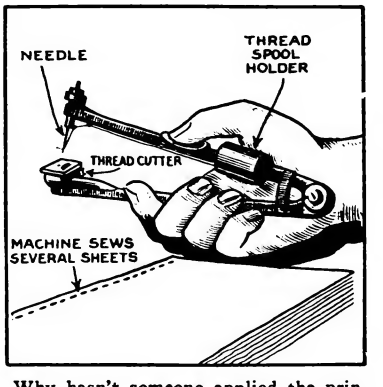
We start off this month with a needed invention relating to sports; to be exact, a kickless shotgun. Shells used in such guns are large and contain considerable powder. The result, upon firing, is a very severe kick, as many amateur hunters have discovered to their surprise. Perhaps some sort of an attachment that could be placed on the stock of a gun would absorb this recoil energy. At any rate, this represents a nice problem. The first kickless gun attachment or fitting to reach the market would sell in a big way.

Can you design a comb which will deliver hair tonic directly to the scalp? Of course, this one will do the trick, but there is plenty of room for improvement.

Beads for necklaces are invariably made of a hard, vitreous material, the sharp edges of which cut through string, wire or chain. Eventually milady finds herself picking up beads from the floor. What is needed is a method of mounting beads to prevent this — either some system of treating the raw edges of the beads or providing them with invisible guides.



A simple spring-actuated mechanism for agitating photographic solutions in developing tanks, would meet with instant favor if it were manufactured and sold at a reasonable price. The suggestion outlined can stand considerable improvement.



Why hasn't someone applied the principle of the sewing machine toward "stapling" papers together.

If you are an inventor and are able to supply the ideal solution to any one of these problems, and if you will properly exploit it, your future financial welfare will be assured.

Any manufacturer of jewelry will admit that such an invention would be worth a great deal of money.

During the course of a year, a stenographer spends considerable time cleaning the keys and type of her typewriter. This is done with a solvent and a little brush. There should be some sort of a gadget that could be attached to a machine and that would gently brush each letter as it swept by. It should be designed so that it could be attached to typewriters now in use. There is a potential market for a million items which would do this work.

A manufacturer of a liquid scalp treatment would like to see some sort of an applicator with which such a liquid could be applied directly to the scalp without wetting the hair too much. This would place the tonic directly where it was needed and would greatly reduce its cost to the consumer by making a bottle last longer.

We are all familiar with foam baths. A modification of this principle would be to spray liquid soap on the face where it will foam and automatically get the face ready for shaving.

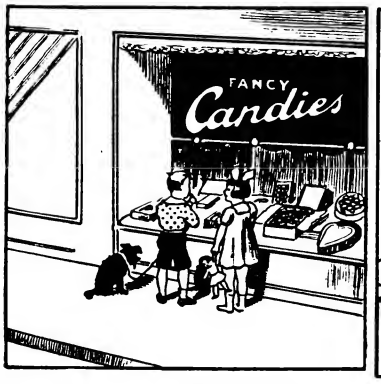
Many types of can openers turn down the edges, but the turned down edges are still sharp. Someone should develop an opener which will roll back the edges. This would make a hit.

It would also overcome other objections to its use. Such a device should retail at not more than a dollar.

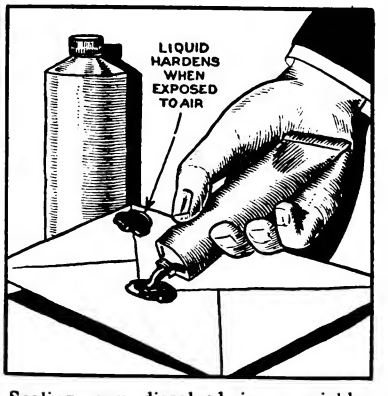
Many of the larger corporations now use complicated and expensive check signing machines to handle many thousand checks in a single day; but often officials of smaller corporations have many checks to sign, yet they cannot afford to invest large sums for an automatic check-signing machine. Here is an opportunity to design a little machine to handle about 1,000 checks an hour costing about ten or fifteen dollars.

And speaking of checks, we find that

(*Continued on page* 95)



A small fortune could be made, almost overnight, with a formula, or a method of treatment to prevent chocolate coverings on candy from turning gray.



Sealing wax dissolved in a quickly evaporating solvent, would meet with a ready sale. Many other uses can be found for the product besides employing it for sealing envelopes.

Candid Photography

Photographic Development for Amateurs

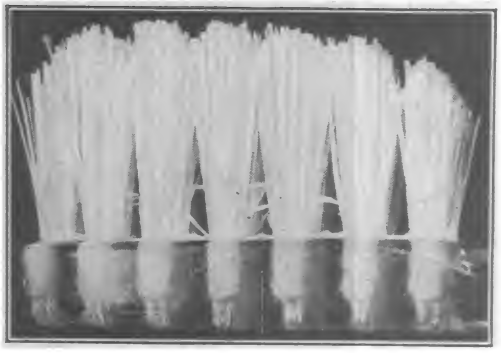
By Herbert C. McKay

Beach Candids, usually made in blazing sunlight, with high contrast, can be kept down to a pleasing tonal range by cutting development time to two-thirds or even one-half normal.

PHOTOGRAPIC development is simple when you understand its purpose and the result of the various steps involved; such development consists of submitting the film to the action of chemicals which change the light affected silver salt into metallic silver. As far as this simple chemical change is concerned it cannot be regarded as complex. However, when we stop to consider that this change must be carefully controlled so that the amount of metallic silver deposited in the negative is proportionate to the amount of light which fell upon the film, some complexity comes into the work.

The heart of the developing solution is the developing agent, more commonly known as the reducer. It is of the utmost importance that the beginner in photography learns to differentiate between this reducer used in the developer and the so-called reducer which is used to decrease the intensity of overexposed negatives.

The developing agent or reducer is usually a complex, organic compound. Some of the older developers using simple chemicals are no longer employed. The more common of the developers are Metol, Hydroquinon, Pyro, Glycin and Paraphenylene Diamine. The last name is often referred to as "P-D" and in some cases as p-diamine. There are many others, but these are the more common ones used in modern photo developing.



Normal development gives brilliant contrast without loss of detail in the highlights.

A solution of the developing agent in water will perform the function of development; at the same time the reducer has such an affinity for the oxygen of the air that it will rapidly absorb this oxygen and so

With low contrast in the original, prolonging the development of the film will produce a greater contrast in the print than in the original.

Photographic development has been made so mechanical, apparently, that most amateurs can do their own processing. Nevertheless, many do not get the best possible results from their work. Too often you will find members of amateur photographic clubs speaking in a very profound manner of such things as "gamma," "low-energy developer," "surface development" and so on, yet these same amateurs cannot, or do not perform a really good job of development.

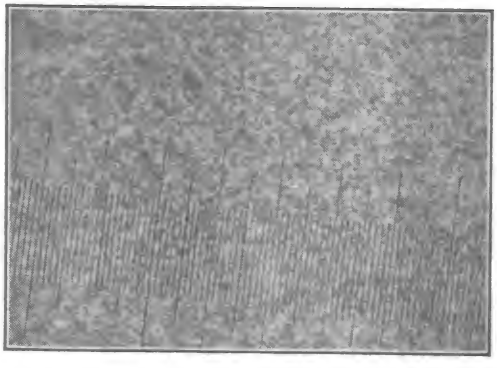
This type of a subject does best when given normal development.

Here again, where contrast in the original is lacking, increasing the time of the development will help the subject.

lose its strength. This is accompanied by a marked change in color, the solution rapidly becoming yellow-brown and then a deep chocolate brown. When this takes place the developer stains the gelatin of the emulsion very deeply and also loses its power.

It has been found that the addition of a sulphite will prevent this rapid oxidation, although the reason for this is not fully understood at present. At one time it was thought that the sulphite had a greater affinity for oxygen than the developing agent and so produced the preservative action, but this has been found to be untrue. However, as practical photographers, we are not concerned with the complex chemical reaction but with the desired results, instead

In high speed subjects the exposure given to stop motion is frequently on the under side. Less than normal development prevents too much contrast.



The actual grain structure of a film can be seen in this photomicrograph. Each large division of the scale represents .04 mm; each small division measures 4 microns.

It is desirable to force the penetration of the developer into the gelatin as rapidly as possible in order to produce uniform results. The easiest way to do this is to mix an alkali with the developer. The most commonly used is refined washing soda—sodium carbonate. The destructive action of the alkali is a secondary and unfortunate factor; the action of this alkali is really a chemical one in that it changes the rate of ionization in the solution.

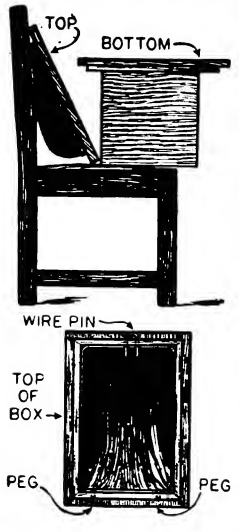
In some cases a bromide (usually the

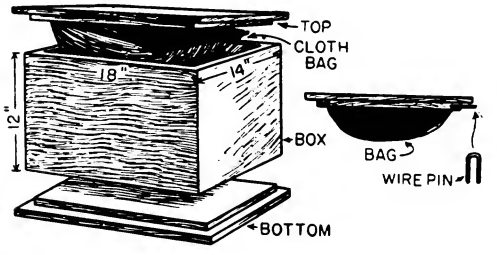
(*Continued on page 74*)

Popular Magic

By Dunninger

MANY years ago the writer originated this effect which he termed "Rabbit Production Deluxe"; he presented it before many well-known magicians who were completely mystified as to the method used. In effect, the audience sees a wooden box frame resting upon a chair seat. The lid is standing against the back of a chair and the bottom of the box is set loosely on the frame. The magician picks up the top in one hand and the four-sided unit in the other and exhibits both freely. The audience can see that neither the bottom nor the sides are fitted with secret compartments. Assembling the box the magician lightly rests the top in its proper position and apparently realizing that the audience has not had an opportunity to examine this top, he removes it instantly and exhibits both sides of the cover to show that this is unprepared. Replacing the cover, he steps back for a few moments and then reaches forward and knocks off the top and a live rabbit comes out of the box. From its interior he then withdraws any of the customary production loads such as silks, ribbons, baby's clothes, etc.





This mystic production box allows for a more careful examination than is possible with similar boxes. It will accommodate a very large load, including a rabbit and, if necessary, several pigeons. The load is contained in the cloth bag affixed to the top of the box, which can be released into the interior by merely withdrawing a pin. The item is set up for stage production, as is illustrated in the diagram at the left.

Explanation: The box itself and the

Joseph Dunninger, celebrated "mentalist" and magician, whose articles appear exclusively in this publication, is the world's foremost society entertainer, and has appeared before more celebrities than any of his contemporaries. Among those he has mystified are President Franklin D. Roosevelt, ex-Presidents William Howard Taft, Calvin Coolidge, Warren Harding, Herbert Hoover and Theodore Roosevelt, H. R. H. Duke of Windsor (formerly King Edward VIII), Thomas A. Edison, etc.

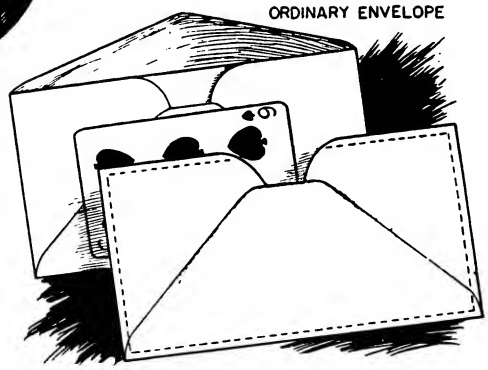
bottom are entirely unprepared; but, attached to the bottom of the lid is a large cloth bag which holds the rabbit and the production load. This black cloth bag is fastened to a wire frame which fits the top and is held in position by two pins at one end and by a loose-leaf fitting pin, or bolt, at the other end. In its position upon the chair, the audience does not suspect that the load is carried by the lid. Under cover of the misdirections of "testing" the top to demonstrate that it fits, the magician secretly pulls

This stage of the divining trick is employed merely to throw the spectators off the track. The manipulations necessary for the successful performance have been accomplished by this time and the magician knows the color of the stick contained within the small metal tube.

the pin out allowing the entire load to drop into the bottom of the box. So rapid is this movement that the audience never suspects that the load has been transferred. Immediately thereafter, the cover is held up for examination. From this point on the load can be produced at will.

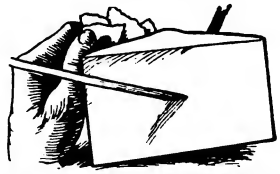
A rather mysterious effect that can be prepared quickly is the resurrected card. In effect, the magician requests a member of the audience to select a card from an unprepared deck. He takes an ordinary envelope and cutting a slit through it, suspends this upon a length of ribbon, the ends of which are held by two spectators. The magician now requests that the spectator tear his selected card into little bits and put them into the suspended envelope, sealing the flap. After a few mysterious passes, the magician tears the envelope open and exposes the selected card suspended from the middle of the ribbon which passes through a slit in the center. Although the results are little short of miraculous,

(*Continued on page 94*)



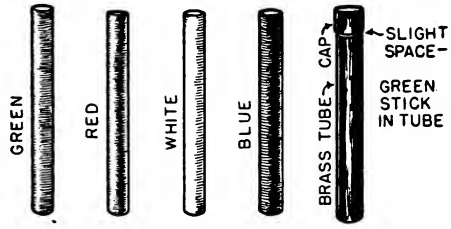
BACK FROM ENVELOPE—PASTE ROUND EDGE

With the aid of a false back, it becomes possible to resurrect a torn card which makes its appearance on the middle of a ribbon, the ends of which are held by two spectators.

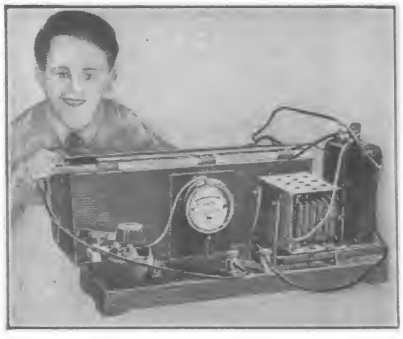


RIBBON THROUGH ENVELOPE

This is the way the ribbon passes through the envelope. The torn pieces are dropped into the unprepared section of the cover.



A very slight difference in the thickness and length of these sticks, makes possible an interesting divination effect. All the necessary apparatus can be prepared in one evening.



The apparatus for electroplating is very simply made. It consists of a tank or a wooden box, voltmeter, trickle charger, rheostat and switch.

Electroplating Flowers

Small land and marine life make excellent objects which can be plated either with copper or nickel by the very simple process described in the accompanying text.

By Lawrence Kranis

WHEN wandering through the garden or the woods one often finds various objects such as flowers, leaves, ferns, insects, etc., and along rivers or the seashore many other items are found such as seashells, seaweeds, small insects and fish which would look well if preserved in metal or used as ornaments.

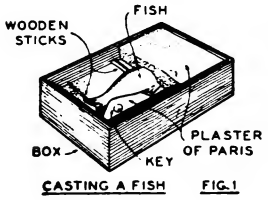
A small fish can be made into a metal replica and a beetle can be made into a ring or brooch. Seashells can be formed into rings, necklaces and the like. Art or decorative objects can be made from the natural materials.

A metalized flower makes an interesting art object.

Before electroplating, the article must be rendered electrically conductive. Brushing graphite over a stiff flower serves the purpose.

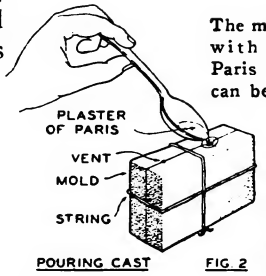
For these experiments the materials needed are few and inexpensive; the pleasure derived in creating and designing make this a splendid pastime calling for no previous experience. If you have a small fish or similar object which you would like to copy, a mold will be necessary. Using thin cardboard, make a small box into which the object will fit; the box should be about ½" higher than the object with about 1" space all around it.

Mix plaster of Paris to the consistency of cream and half fill the box (oil the inside of the



CASTING A FISH FIG. 1

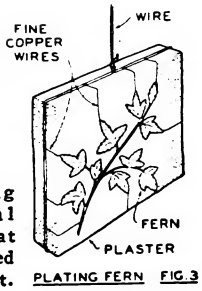
Many duplicates can be made from one object by forming a mold as illustrated at the left.



POURING CAST FIG. 2

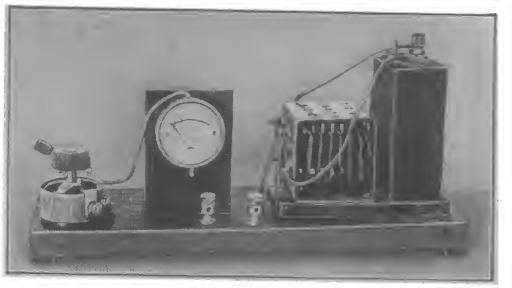
The mold is filled with plaster of Paris which then can be metalized.

For making thin metal leaves, treat as illustrated at the right.



PLATING FERN FIG. 3

By massing together a group of electroplated flowers and small insects, you can convert them into metal picture frames or use them for decorations on ornamental flower or aquarium stands.



The power unit for electroplating is illustrated in this photograph. The tricle charger and rectifier are seen at the right. Trickle chargers were used in the days of battery radio sets.

box first). Cover the fish with oil to prevent the plaster sticking to it. Place the fish into the plaster imbedding it half way. When the plaster is almost dry, press a small round piece of wood against the fish; this should be long enough to lead to the edge of the box; later, it will form the channel for pouring. Also, dig two small cone-shaped holes with a knife point in the plaster to form keys.

When the plaster is thoroughly dry, paint the top and fish, with another coat of oil. Now fill the box with plaster of Paris; the wooden piece remains in place to complete the second half of the pouring hole.

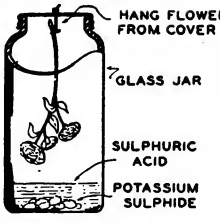
When thoroughly dry, separate the mold; remove and discard the fish.

Dip both halves of the mold into melted paraffin to get a smooth surface. To make copies, tie both forms together after oiling each on the inside. Through the hole pour plaster of Paris mixed with water to a cream-like consistency until it reaches the top.

After the plaster form has dried open the casting, remove the replica and dip it into melted wax. In this manner, as many copies as desired may be made. (If the original has many undercuts, a flexible mold must be used.)

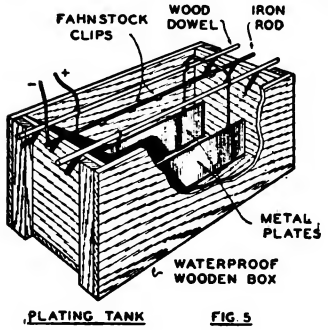
For the replica, molding wax or plaster of Paris can be used. For ferns, only a half cast is necessary. On the other hand, if a beetle is to be made into a

(*Continued on page 73*)



PREPARING FLOWER FIG. 4

If the flower is very delicate, it should be suspended in a solution of silver nitrate made as described in the accompanying article. It is then supported in an atmosphere of hydrogen sulphide as illustrated in the diagram at the left. It is advisable to punch a hole in the cap of this jar or to fit the cap on loosely to prevent explosion from accumulated gases.



PLATING TANK FIG. 5

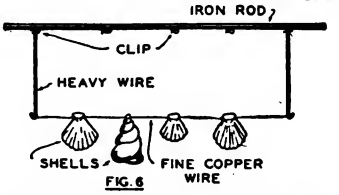
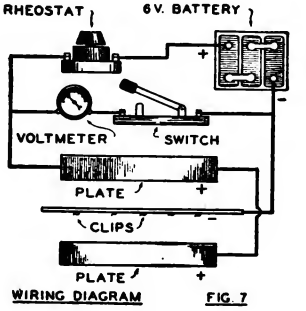


FIG. 6

The article to be metalized is suspended from the middle electrode and is flanked on either side by copper plates (when copper-plating) or nickel plates (for nickel-plating). The diagram at the right furnishes a circuit for use with a battery.



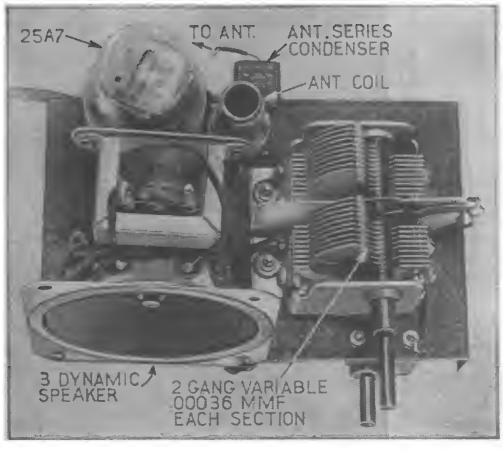
WIRING DIAGRAM FIG. 7

How to Build a *One-Tube* AC-DC Loud Speaker Receiver

By J. T. Bernsley

Designed especially for our readers.

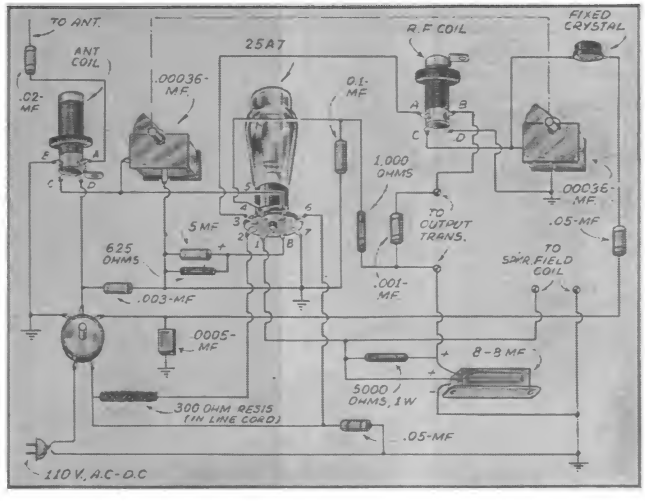
RADIO constructors and experimenters who have been on the lookout for a simple one-tube loudspeaker set will find their goal achieved after constructing the set here described. Good loud-speaker volume is obtained from this set on all local stations, with fair selectivity, and best of all, complete electric operation from any 110-volt supply whether it be AC or DC. Another good feature is that a dynamic speaker can be and is used with this set; this permits attaining a good degree of quality in the reproduction.



Looking at the chassis of the one-tube A.C.-D.C. Midget Receiver. This set will give loudspeaker volume.

In operation and efficiency, this receiver compares very favorably with the familiar 4-tube T.R.F. AC-DC Midget receiver which is now so popular with the listening public. It employs one control for tuning (coupled to a 2-gang variable condenser), and one control for volume with a switch for turning the power to the set "on" or "off." The antenna consists of a reel of flexible wire which may be connected to a regular antenna, or one end may be thrown out of a window in very congested areas and when only local station reception is desired. Even in appearance the one tube receiver resembles the average midget set, except that it is somewhat smaller, in this particular case; however, it may be installed in a conventional midget cabinet if the constructor so desires.

There's an old saying that one

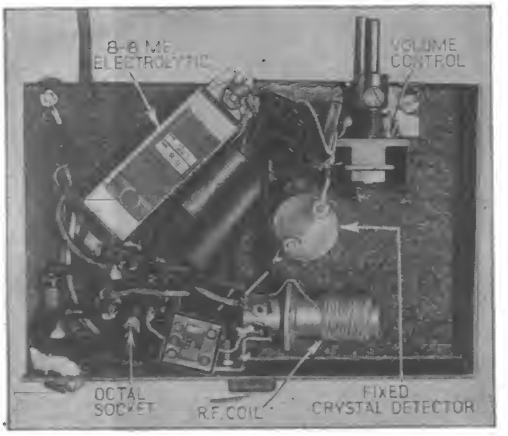


Physical diagram of the receiver. For those unfamiliar with following schematic diagrams, this layout will simplify the wiring.

Loudspeaker reception on local stations is possible with this little one-tube 110 Volts A.C.-D.C. receiver. The circuit employed is ingenious, since by means of reflexing and a crystal detector four tube efficiency is obtained from just the one tube. It is needless to add that extreme economy in operation is a result of this design.

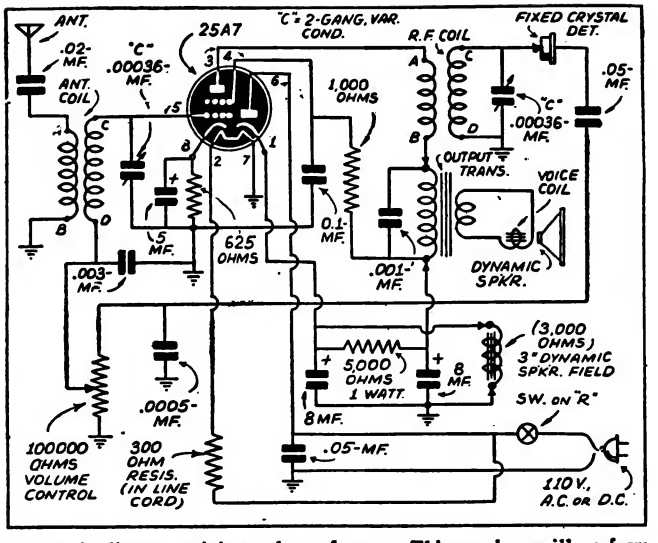
Right — Complete view of the receiver. The knob at the left is merely glued to the cabinet to present a symmetrical appearance. It serves no function.

picture tells more than ten thousand words, so we're going to let the photographs and wiring diagrams accompanying this article tell the story for us. For the sake of the beginner in radio, however, we furnish some explanation of the wiring diagram as well as a few pertinent hints concerning some of the difficulties that may arise, all of which may make his task of constructing this receiver somewhat easier.



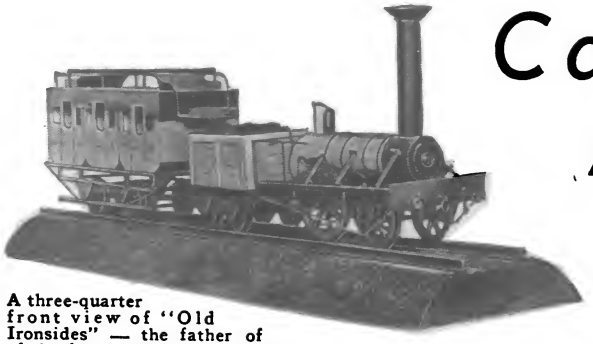
Right—Bottom view of the chassis, showing the parts and wiring. The crystal detector must be sensitive for good results.

It will be noted from the diagrams (both schematic and pictorial) that the tube employed in this set is that known as a 25A7 tube. This tube employs a heater which requires 25 volts at .3 of an ampere, and includes within its glass envelope a pentode amplifier as well as a half-wave rectifier. Now, in the circuit of this receiver, the pentode section of the tube is employed first as an R.F. amplifier stage the output of which connects to a crystal detector which serves as detector of the amplified R.F. signals. After detection, the signals are fed back to the pentode section for amplification at audio frequencies, and then fed to the loudspeaker. The half-wave rectifier section serves to supply the "B" supply or high voltage DC regardless of whether the unit is connected to AC or



Schematic diagram, giving values of parts. This receiver will perform excellently.

(*Continued on page* 89)



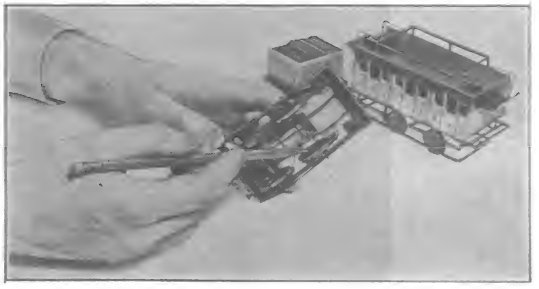
A three-quarter front view of "Old Ironsides" — the father of of the four wheeled locomotive.

Cardboard Models

THE BALDWIN FOUR WHEELER

by Herbert Lozier

"OLD IRONSIDES" did about twenty-seven miles an hour over the rails and pulled a load of about thirty tons. Baldwin was the first American builder to ship locomotives from the United States; Austria was the first purchaser; since then, American locomotives have been found throughout the world.



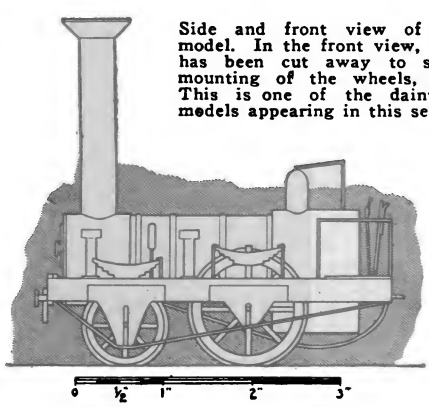
A good idea of the size of this model can be gained by making comparisons with the pencil and hands. The author is pointing to the pistons and their connection with the crankshaft.

While the model is copied closely from "Old Ironsides," some details have been added to make it a "typical" model of that time. Most illustrations of the early roads, such as the Boston and Worchester, and the Albany and Buffalo, pictured then thus.

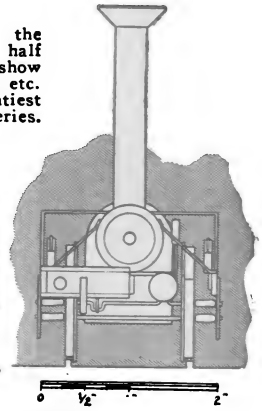
The model is too small to be made as a working model, but it is colorful and makes an excellent decoration — besides being built to scale so that it can be added to the monthly collection of American locomotives. It is the first of the series to have a coach.

To begin the model, build the frame, Fig. 3, of the locomotive. The members are hard balsa wood 1/16" thick. The two side pieces measure ¼" x 1/16", about 3⅞" long. The front is 2" long and 7/16" wide. The rear is ¼" wide, 2" long, and 1/16" thick. They are simply glued together as shown on the plan to form the oblong frame. The front may be joined to the side members for strength if desired. Then a 1/16" x 2" piece is glued immediately behind the top piece. When the frame has dried thoroughly, a heavy cardboard piece 2"

Side and front view of the model. In the front view, half has been cut away to show mounting of the wheels, etc. This is one of the daintiest models appearing in this series.



ENGINE FIG. 1



ENGINE FIG. 2

This four-wheeler was the father of the 65,000 odd locomotives that the great Baldwin Locomotive Works have built for American and foreign roads.

The original engine, named "Old Ironsides," was built after the jeweler (Baldwin was a jeweler by trade) had successfully constructed a small model which ran in a Philadelphia museum.

The original "Old Ironsides" did about twenty-seven miles an hour and pulled a load of thirty tons. Additional details have been added to this representation to make this a "typical" model of a first American locomotive.

long and ¾" wide with a well ⅜" x 1" cut in, as shown, is glued to the rear of the frame.

The fire-box is built up of four pieces of cardboard. The front and rear patterns are given on Fig. 4. When they have been cut out, a piece 3⅜" long and 1" wide, is glued over the ends and a bottom is added. Hold the assembly together with pins and allow to dry.

The boiler is made from a piece of cardboard 2⅝" x 2⅜". This is wrapped around a dowel ¾" in diameter and is glued at the seam. Over the forward end, to stimulate the smoke-box, wrap another piece ¾" wide, as shown. Secure the pieces to the dowel with rubber bands until dry.

Glue the boiler directly to the fire-box after a disc has been added to the front and rear of the boiler. The discs are ¾" in diameter. The boiler should go just short of ⅛" down from the top of the fire-box. Allow to dry, then glue the fire-box in the groove of the platform in the rear of the frame. If the groove is too narrow, trim to fit. The fire-box should be about ¾" higher than the platform.

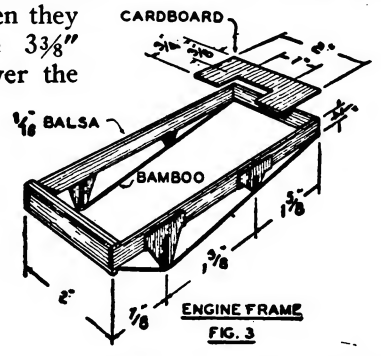


FIG. 3

Turn the locomotive over and add the cylinders, Fig. 5. They are made in the same fashion as the boiler, except that they are fashioned from a piece 1¼" long and ¾" wide wrapped around a ¼" dowel. When they have dried, add a front and rear disc, ½" in diameter. The rear discs should have a hole in the center large enough to receive a 1/16" rod.

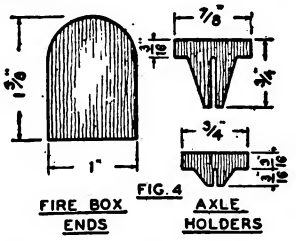
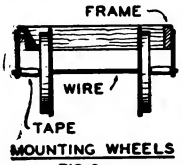


FIG. 4

The cylinders, in turn, are glued to a piece of cardboard 1" x ½", as shown in Fig. 5. This assembly is glided directly to the bottom of the smoke-box. When it has dried in place, add a small block of balsa ¼" square and ⅛" thick. It is glued to the rear of the front part of the frame and then to the cardboard piece holding the cylinders.

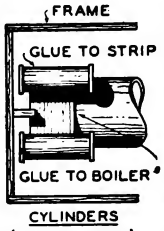
The stack is made of cardboard

Right — The cylinders are glued directly to the bottom of the smoke box, first being glued to a strip of cardboard.



MOUNTING WHEELS

FIG. 6



CYLINDERS (FROM BELOW)

FIG. 5

Left — Tape is added to prevent the wheels from shifting from side to side.

The details in the above two diagrams show measurements and construction of the frame and also give details of the axle - holders.

The wheels fit into these holders and are held in position by small blocks of balsa.

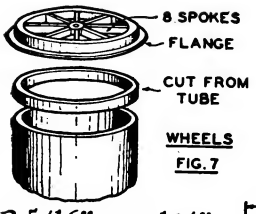


FIG. 7

The diagram at the left shows the construction of the wheels; the flange is glued into position.

Below—Wheel dimensions are given in this illustration. The spokes are mounted around a balsa hub.

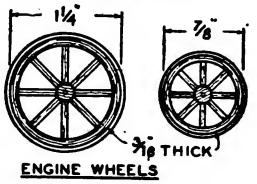


FIG. 8

2-5/16" x 1⅜" wrapped around a length of 7/16" dowel. A carved balsa top is added.

Insert the stack in a hole made carefully in the top center of the smoke-box. The hole should be ½" in diameter. The stack stands 2¼" above the top of the smoke-box.

Four axle-holders (Fig. 4) are placed in their proper positions on the *outside* of the frame, as shown in Figs. 1 and 3. In them the wheel and axle assembly, Fig. 6, is held. It may be necessary to place a small length of 1/16" balsa in the front axle holder between the frame and the axle, to give the wheels the proper position, but this is merely an adjustment and need not be worried about until the wheels are finished and ready to be put in place.

The front wheels are ⅞" in diameter, and eight spokes mounted around a balsa hub ⅛" in diameter (Figs. 7 and 8). The flanges extend 1/16" beyond the diameter of the wheel rims. The wheels in turn are mounted on an axle 2⅛" long. The axle may be either heavy wire or 1/16" diameter dowel. Tape should be wrapped around the axle between the wheel and the axle holder to prevent side sway. See the plan; they are spaced to fit an "O" gauge rail.

The driving wheels are 1¼" in diameter and also have eight spokes mounted around a ⅛" diameter hub. The axle is wire with the cranks bent in it before the wheels are put in place; bend it from a piece 3½" long, then trim the ends off until the rod is 2⅛" long. Place the wheels on the axle and wrap tape around, in the same manner as the forward wheels. Then slip into the holders.

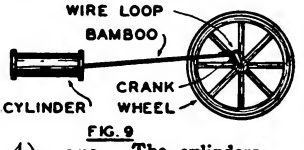


FIG. 9

The cylinders on this model and the drive mechanism is very simple, as explained by the diagram above.

To prevent the wheels from falling out, a length of 1/16" square bamboo is placed along the bottom of the holders and from there to the frame, as shown in Fig. 1. Glue these pieces securely in position.

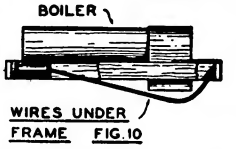


FIG. 10

Lengths of heavy wire run from the cylinders to bottom of the platform for reinforcement.

The springs in the model are whittled from small blocks of balsa and are then grooved to represent leaves of the conventional type of spring.

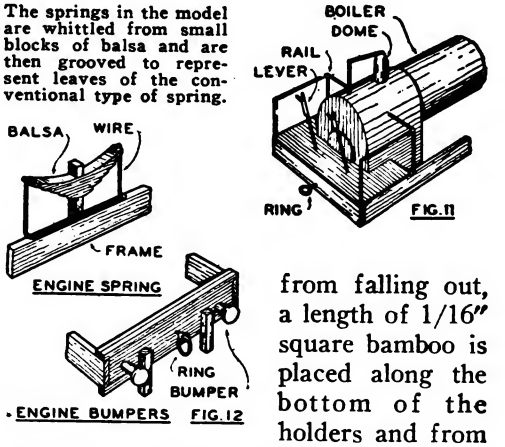


FIG. 12

Now the piston rods are made. They are 1/16" dowel or bamboo about 2" long. Insert one end into the hole in the cylinders and glue a loop of copper wire to the other end (Fig. 9). Make sure that the loop is bent around the cranks in the axle before being glued

The tenders are of very simple construction being built up on a balsa frame.

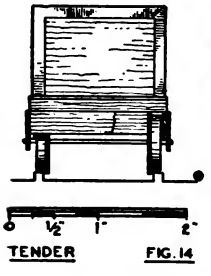


FIG. 14

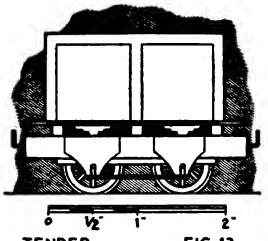
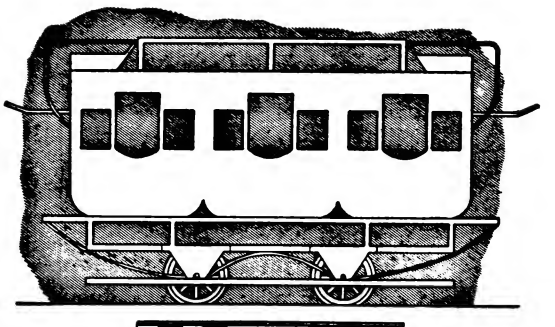


FIG. 13

The tender is filled with wood — ordinary wooden matchsticks, glued in place. It is advisable to give the wood a dark brown stain and roughen the lumber with the fingernail.

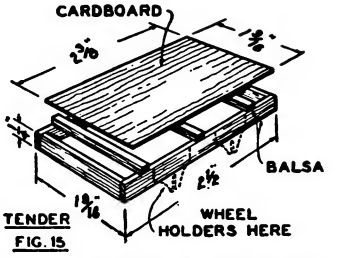
to the rods. When the glue has dried turn the wheels and see that the rods work easily. If not, adjust carefully. Add two extra lengths of heavy wire from the cyliner-ends to the bottom of the platform (Fig. 10). They are shown on the drawings.

The detail needs little description. The rail around the rear platform, the brakes, and the lever topping the dome are all made of 1/16" square bamboo (Fig. 11). The dome is carved from a ¼" diameter dowel and glued in position on the fire-box. The four springs are carved from lengths of balsa wood and mounted on the frame with copper wire and balsa supports. The bumpers are two discs of 3/16" diameter cardboard glued to a dowel 1/16" diameter, ⅛" long; they are glued in place on the front ¼" in from the ends of the frame together with two ½" lengths of 1/16" dowel. The hook and ring is bent from copper wire. The four boiler supports, that run from the boiler to the frame, are cardboard lengths cut to shape and glued into position. Half a small snap fastener is glued to the center of the forward end of the boiler. The straps about the boiler may be made of ⅛" wide strips of brass, or gold-painted cardboard.



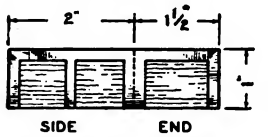
COACH FIG. 17

This is a side view of one of the coaches. You can make several of these if you desire.



TENDER FIG. 15

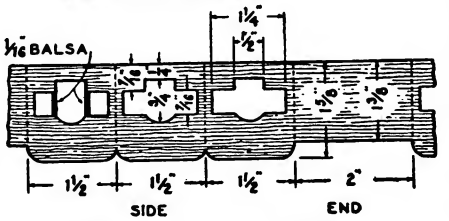
Here is shown the assembly of the body of the tender. The sides are attached to this frame.



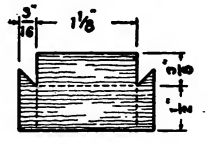
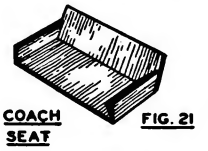
TENDER BODY FIG. 16

This represents half of the tender body. It is advisable that the entire body be made in one piece which is then folded as shown by the dotted line.

Here again half the coach body is represented. The entire body should be cut out at one time.



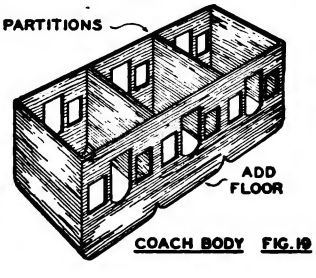
COACH BODY FIG. 18



COACH SEAT FIG. 21

The engine is painted black with red wheel rims and bumpers. The boiler in back of the smoke-box is green.

The tender (Figs. 13 and 14) is a simple affair that needs little explanation. The frame or chassis (Fig. 15) is built up in the same way as that of the locomotive. Balsa wood is used and it is 1/16" thick. The front and rear members are 1-9/16" long and ¼" wide. The side pieces are 2½" long and ¼" wide. They are glued together and allowed to dry. Across the top of the frame three ⅛" square pieces 1-9/16" long are glued. They are spaced about ¾" apart, measuring out from the center piece. Above these pieces a flat piece of

(*Continued on page* 86)



COACH BODY FIG. 19

Two partitions divide the coach body into three compartments, as is indicated in this illustration. For details of the coach frame, see Fig. 22.

LATHE HINTS

BY JOSEPH

In this installment of this series, the author describes the method of making ring chucks for small work and end boring; how spacers can be turned from thin-walled tubing; the construction of an abrasive vee block for repolishing dead centers; the making of a fitment to permit a chuck or face-plate to be used on the drill press table; a simple clamp for holding small work, and a very easy method for making spanner wrenches.

AN efficient type of work holding device for wood turning which is commonly utilized commercially, is described in Fig. 1. This is called a "ring chuck" and has certain advantages over the screw plate and jaw chuck in holding work of small diameter for end-grain recessing or boring. The form cross-sectioned in the upper half of Fig. 1 can be made quite easily in any screw-cutting lathe, while that detailed below is designed for construction in an ordinary slide-rest lathe. A standard faced hexagonal nut is procured to fit the spindle nose and it is turned to force fit into a length of steel tube. The two are pinned together as shown, to form the equivalent of the standard type above. A possible refinement on either of the two types might be to knurl a short length of the tube for easier manipulation. In use, one end of the work is first turned between centers to fit the chuck,

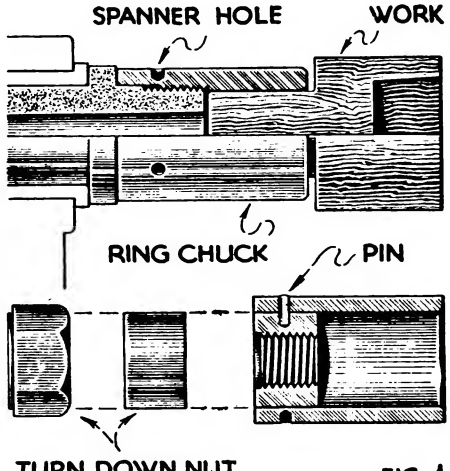


FIG. 1

Ring chucks can be made to fit either the wood-turning or the screw-cutting lathe.

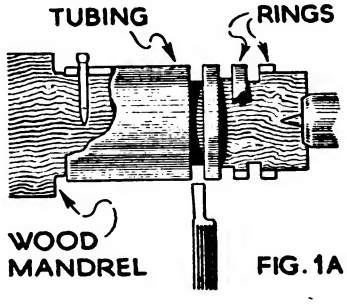


FIG. 1A

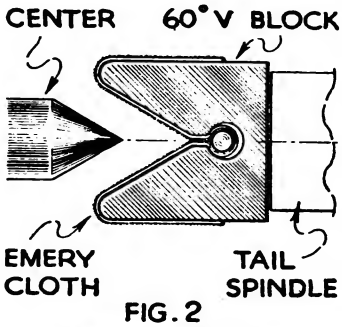


FIG. 2

Two very useful hints.

then it is driven into the chuck as shown.

Thin walled tubing is unusually difficult to handle in lathe work, and when it is used to make narrow spacers, rings, or bezels, a serious problem is encountered. One of the most positive solutions is to use a wooden mandrel between centers as shown in Fig. 1A. A close-grained hardwood rod is turned to fit the tube snugly and before inserting the wood member, dampen it with a moist cloth. This expands the wood to make a secure and chatterless mounting for the tube. For additional security in heavier work, a brad or nail can be driven through a hole in the tube as shown.

A device is drawn in Fig. 2 which, if properly used, can be of inestimable value in lathe work. This is an abrasive vee block, used to repolish and smooth hardened dead centers which have been slightly burred or roughed after a particularly heavy turning job.

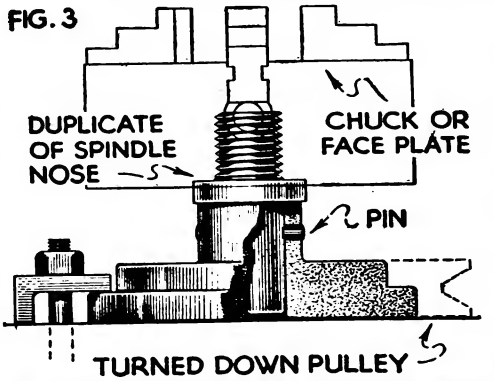
and ODD KINKS

PIGNONE

It must be realized, however, that it is not intended to retrue a badly worn and scored center—only power grinding is adequate for this purpose. A block of any metal about 2" by 1" square is grooved and slotted as shown in Fig. 2. Observe the hole drilled at the base of the vee groove which, in conjunction with a 2" length of rod, is used to hold the emery cloth. The best medium to secure the cloth to the vee block surface is heavy shellac.

An unusual and useful accessory is shown in Fig. 3 which will greatly increase the scope and utility of the drill press. This is a base plate to be used on the drill press table. Thus, any of the lathe spindle attachments, particularly the face plate and four jaw chuck are made available to hold work for drilling. An ordinary heavy-duty iron pulley is faced, stepped, and rebored for the purpose, as cross-sectioned in Fig. 3. The shouldered end of a steel rod is force fitted and pinned in the base member hole, and then the assembly is clamped to the face plate and a duplicate of the spindle nose is turned thereon. If the lathe in use is of the lighter non-screw-cutting type, a replacement spindle can be procured from the manufacturer and altered easily for the purpose.

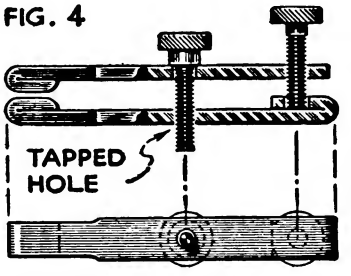
FIG. 3



By making several holders as shown here, work can be transferred with the chuck to the work bench, drill press table, or any other place desired, without removing it from the chuck. This facilitates completion of the job and saves much time which would be lost in replacing and centering the work in the chuck.

The parallel clamp illustrated in Fig. 4 is suited especially for soldering small work. The principal disadvantage of regular clamps for soldering purposes is that because of their heavy construction, too much heat is absorbed from the work. Secondly the unyielding character of ordinary clamps results in marks being indented in the work because of expansion in heating. By constructing this clamp of light, relatively yielding strap-iron, it adapts itself well for soldering—because of the ease of construction it is recommended that pairs of various lengths and with differently tapered noses be made.

FIG. 4



Small pieces to be soldered can be held in clamps made as illustrated.

Solid spanner wrenches are bothersome to make since the throat must be shaped by hand. By utilizing an inserted steel pin as shown in Fig. 5, such wrenches can be made easily simply by drilling or lathe boring the throat opening. Both types of wrenches are shown.

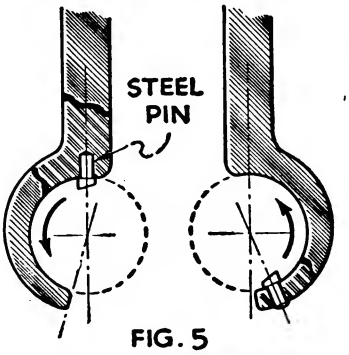


FIG. 5

Spanner wrenches, normally difficult to construct, are manufactured very simply in the home workshop if the method illustrated is employed for the purpose.

Servicing

Part 8

By L. K. Wright

Originator and Chief Instructor of Refrigeration Servicing Course at the New York Y. M. C. A. Trade & Technical School, Author of "Official Refrigeration Service Manual," Vols. I and II—"Official Air Conditioning Service Manual," "Commercial Refrigeration," etc.

The previous articles covered the servicing of refrigeration equipment, outlining the work required in each instance in a step by step manner. Charts and a service outline have been furnished; and now the worker is ready for general service work.

THERE are five general steps involved in rendering service to a machine upon which a complaint has been received.

1. *Complaint.* Listen carefully to the service complaint. In many cases the owner of the machine will explain why you were called upon to render service. He or she may think (or know) the machine is running too long. Again, the box temperature may be too high. As a rule, the customer usually ends up by saying "the machine needs gas." As adding refrigerant is something no other apparatus has done to it, the owner generally thinks of this and imagines it to be the cure-all for any trouble—even if the trouble is found to be a blown fuse. Find out if the condition he complains of came on gradually or suddenly.

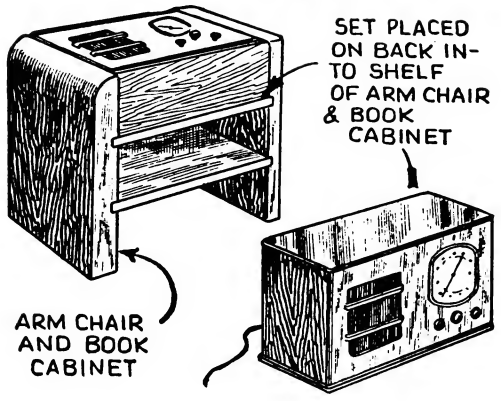
2. *Analysis.* From the data gathered from the customer, analyze the complaint, checking to see if the customer was right in his contentions. Remember, the owner knows little or nothing about the machine. Accept only those things you think are correct regarding the analysis of the complaint.

3. *Check the System.* In-

(*Continued on page 79*)

Left — Installing a new coil in the refrigerator, and below, brushing the dust and dirt out of the cooling fins of the condenser.

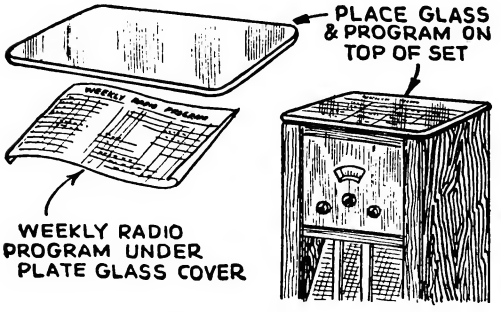
RADIO HINTS AND EXPERIMENTS



A RADIO END TABLE

MANY of the A.C.-D.C. table model sets in use are put toward the back of a table or other piece of furniture, where they are both unsightly and awkward to reach.

Such a set can be converted into an attractive and useful part of the home furnishings by anyone who has a little ability in carpentry. A low end table of the type used beside chairs is made so that the set cabinet just slips snugly into the top shelf, as shown. The lower shelf is a book and magazine rack.



A RADIO TIME TABLE

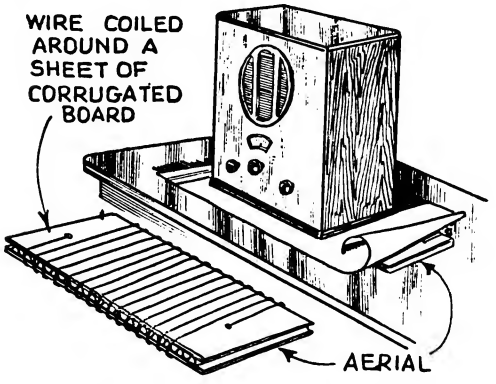
THOSE who follow the scheduled programs of the local stations find that the radio programs published in the newspapers are not always readily available.

If a piece of plate glass is cut to fit the top of the radio cabinet, the programs for an entire week (found in most Sunday papers) can be slipped under the glass, where they may be consulted at any time.

A LOCAL-STATION AERIAL

THOSE who object to stringing the flexible wire (provided as the aerial for many A.C.-D.C. sets), around the living room, and at the same time are interested in listening only to local stations, will find this suggestion a help.

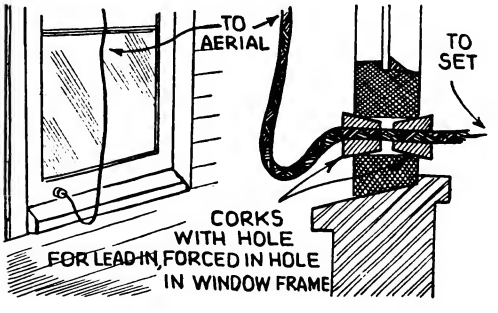
The flexible wire is wrapped around a piece of cardboard, which can be slipped under the set and concealed by a table mat. In most cases this pick-up will be found adequate.



AN EASILY-MADE LEAD-IN INSULATOR

HAVE you had trouble closing the window over the lead-in wire or insulated strip? If so, the trouble can be avoided by drilling a hole (it doesn't have to be large) through the bottom of the lower window sash and threading the wire through. Corks on either side eliminate drafts and prevent rain from getting through.

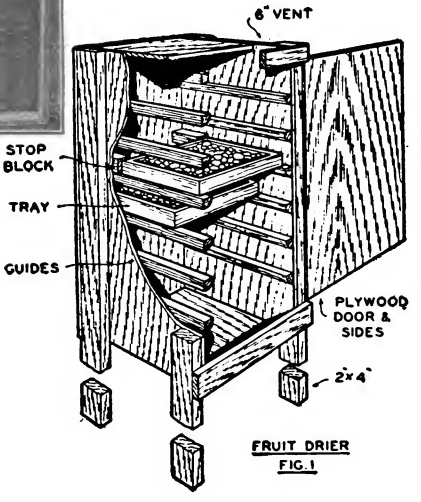
When using this system, remember to leave a length of wire long enough to connect to the radio set when the window is opened; in other words, sufficient play must be allowed.



Fruit Drier *Is Easily Made*

Apples, pears, peaches, and many other fruit and vegetables can be dried in this simple home-made apparatus; the food can be stored for use during winter months. The dried material need merely be soaked in water when it is to be used.

This fruit drier has six staggered trays. It is heated with an ordinary oil stove provided with a baffle-plate of galvanized or sheet-iron a few inches above it and below the first tray.



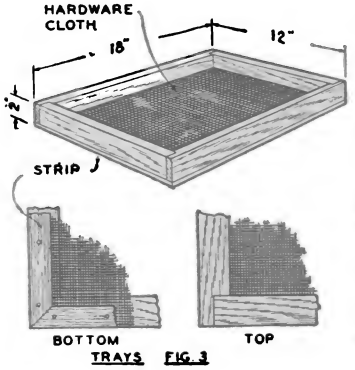
FRUIT DRIER FIG. 1

THIS very convenient fruit drier can be built at very little cost and set up at any convenient spot on the farm. Warm air is circulated around trays by an ordinary oil heater.

Plywood is used in construction as shown here, but ordinary lumber will be satisfactory. Note that the posts are installed on the outside of the walls, leaving more room on the inside. Locate the rails six inches above one another, and nail on stop blocks at the ends of alternate pairs so that the trays, when in position, will be staggered; thus the air circulation covers all the fruit. Install a baffle-plate just over the stove.

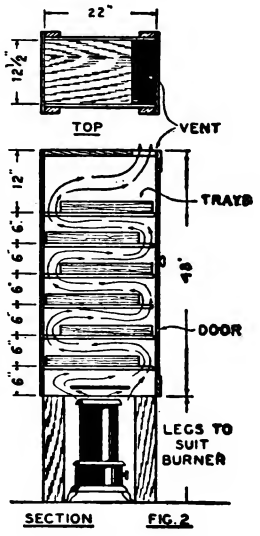
The trays are merely rectangular frames with hardware cloth on the bottom and a wood strip over the edge so that it will slide readily on the rails. A vent is left in the top, and a door of plywood or board-and-batten is hung on front. If plywood is used, give two or three coats of paint, and work it in thoroughly along the edges.

—H. S.



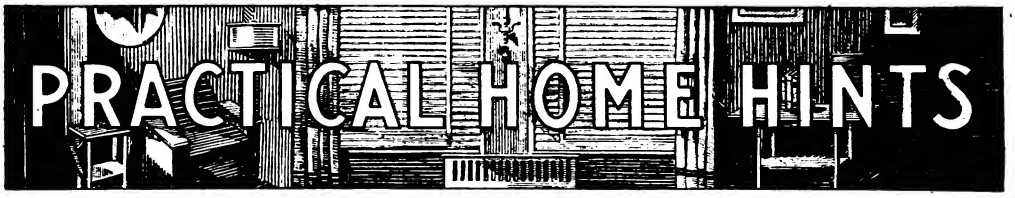
TRAYS FIG. 3

The trays are made as illustrated in the diagram at the left. Although hardware cloth is recommended, any non-rusting open-meshed material may be used here; preferably it should be washable.



SECTION FIG. 2

A section through the fruit drier is illustrated in this diagram at the right. Principal dimensions are also given. The drier may be operated in the open on clear days or in the cellar.



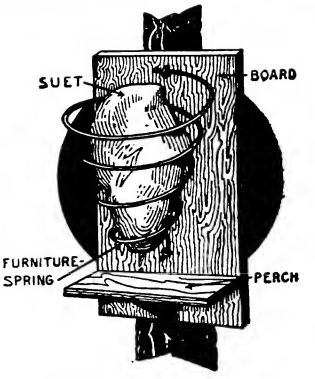
Make Your Hat Windproof

USING thread to match, sew one loop in the hat over the right eye and one loop in the back. Slip a hairpin through each and secure the pins in your hair. This effective means of fastening your hat will do away with unreliable elastics and hat pin holes. —ELLA A. LETTINO.

Avoid Constant Pencil Sharpening

BROKEN points, resulting from dropping pencils, may be averted by weighting the eraser end of the pencil. Removing the rubber, drill a small hole in the wood exposed, and fill the space with No. 9 bird shot or a lead slug. Replace the eraser.

If the pencil drops, the weighted section will strike the ground first and save the lead point.—K. M.

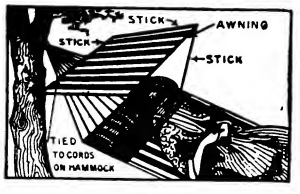


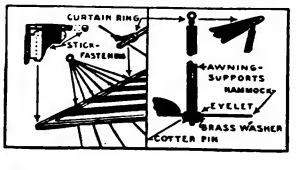
Bird Automat

THE unique bird feeding station in the above drawing consists of a spring mounted on an upright backboard nailed to a post. The food, preferably suet, within the spring, is so held that it affords bold and timid birds equal opportunity to get at the food.—R. W.

Hammock Awning Adds Comfort

TO shade your hammock from the sun's glare, stretch a piece of canvas, over a square frame with folding support poles. Making an eyelet on either side of the head end of the hammock, insert the poles and lash the back of the frame to the hammock cords.—L. R.

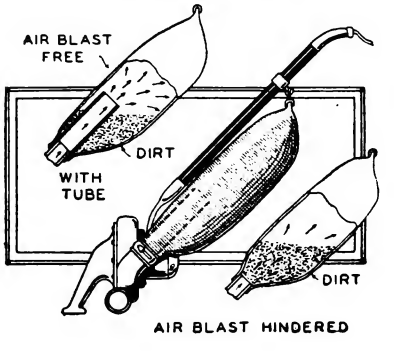




Vacuum Addition Increases Efficiency

A GLANCE at the illustration indicates how a ten-inch

(*Continued on page 79*)



This simply constructed swing will seat four people comfortably.

Covered Swing

For the Children

by

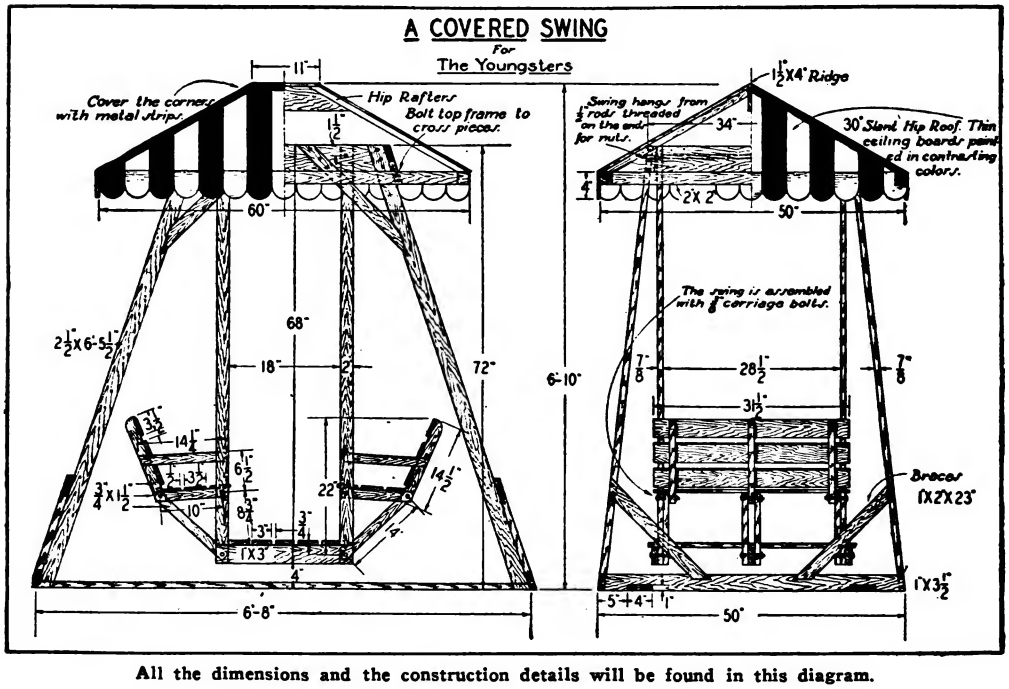
H. L. Weatherby

The covered swing is truly the children's delight. They love any kind of a swing and the canopy provides protection from the sun and sudden showers. Painted in gay colors with its awning-like top it makes a bright spot on the lawn. It is large enough that grown-ups can enjoy it but it is primarily for the children.

WITH spring in the air and summer just around the corner, we can employ our time in the workshop to advantage in preparing equipment that we can use in the yard in the summer.

The frame and swing must be made from a good straight-grained hard-wood, preferably oak, put together with 3/8"

(*Continued on page* 93)

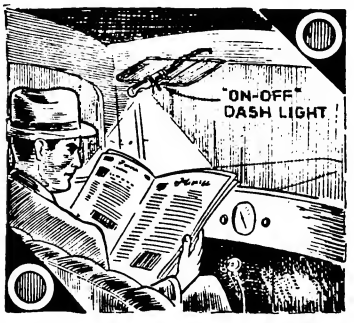


All the dimensions and the construction details will be found in this diagram.

Practical Auto Hints

A Car Reading Light

A DASH light of the type which can be clamped onto the car wherever needed, when secured with small bolts to the back of the windshield visor will make a good reading light. Two wires are passed through a small hole in the header bar and down through the door post to the nearest "live" battery connection. One wire is secured to the "live" terminal while the other is "grounded" to the body of the car.

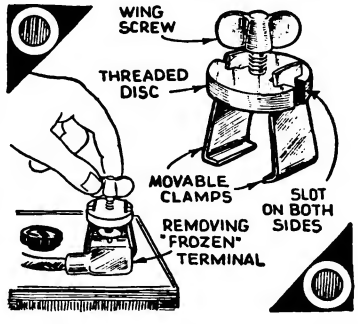


Left—A light just where you want it for reading road maps (or the newspaper while awaiting your guests) can be fitted very easily to the windshield visor.

Right—This very simple clamp can be made in a few minutes. It occupies practically no room in the tool-kit, yet will pay for itself many times over because of the ease with which it allows battery terminals to be removed.

A Handy Battery Cable Puller

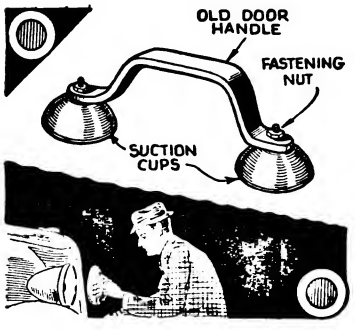
A SIMPLE little tool to remove recalcitrant battery-cable terminals can be made easily from scrap bits of metal and a wing bolt. One piece is formed into a flat disc with slots on opposite sides and a threaded hole through the center to fit the bolt. Two other pieces are provided with right-angle bends at the ends and a cut-out section at the top to fit the slots in the disc. To use, slip the clamps under the terminal and tighten slowly until released.



Headlight Lens Remover

USE this tool if your car has headlights requiring frameless lens removal.

Attach two rubber suction cups (of the type with machine screws projecting from the back) to old screen door handle. Bend the handle slightly so that the cups rest flat against the lens glass. To operate, wet the suction cups and press them firmly against the lens; then push the lens in and turn it (if it screws out) or tilt it by a twisting motion of the hands (if of the tilt variety).

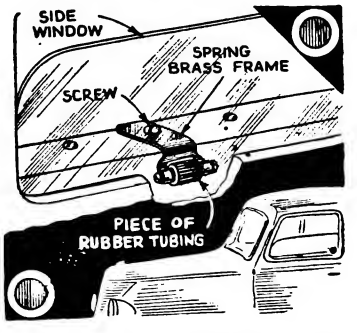


Left — Certain headlight lenses do not come away with the frame. Trying to remove them often is very difficult; but with the gadget illustrated here, the job becomes simple. The cost of this home-made product is negligible.

Right—A piece of spring brass fitted with rubber tubing and pressing against the car windows will remove many of the rattles. The product can be made in the home-shop.

Anti-Rattlers for Car Windows

AN effective cure for the rattling car windows is to fit the doors with suitable springs with short lengths of rubber tubing formed into rollers (to keep the spring from scratching or marring the window). The construction of the springs and rubber pads is evident from the sketch. Fasten them to the offending window frames by removing one of the screws running through the frame and replacing it with a longer one. The bent part of the spring will prevent twisting.



Tips for the Motorcyclist

By Ivan J. Stretten

A Port-Cleaning Tool

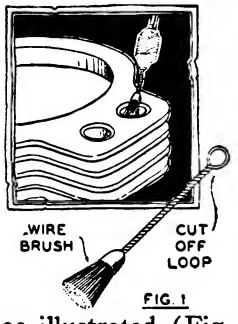
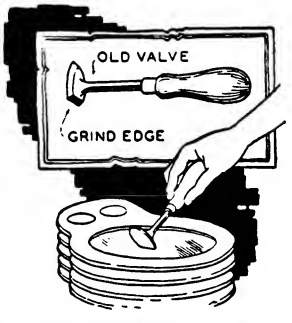


FIG. 1

FOR the cost of a few cents a small wire brush can be purchased and, after the loop on the end of the handle has been cut off, the handle can be held in the chuck of a common drill-brace, as illustrated (Fig. 1). Thus the brush can be rotated quickly inside of valve ports, and will help to clean out these parts after decarbonizing.

A Handy Carbon Scraper



CARBON SCRAPER FIG. 2

A VERY useful tool for decarbonizing a motorcycle engine can be made from an old exhaust valve and a file handle (Fig. 2). The valve head is first softened by heating to redness and allowing to cool slowly. Then a section is filed or ground off and a cutting or scraping edge is formed as shown. The tool is afterwards hardened by quenching in oil, then fit it into a suitable handle.

Repairing Handlebar Grips

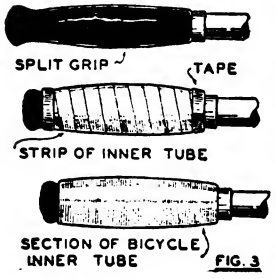
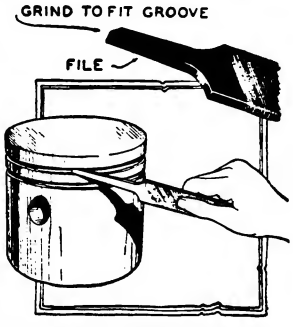


FIG. 3

WORN or split handlebar grips can be repaired quite satisfactorily in the following manner: Cut a strip of old inner tube about ½" wide and of such a length that it can be wound round the grip spirally. Then secure both ends of the spirally-wound rubber with a few turns of friction tape (Fig. 3). Over this pull a section of bicycle inner tube that has been well-saturated inside with rubber cement.

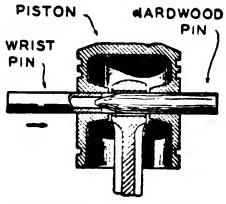
Cleaning Piston Ring Grooves



CLEANING PISTON RING GROOVES FIG. 4

WHEN faced with the task of cleaning out motorcycle piston ring grooves, here is a good tip to follow. Procure a small file and trim up the end of the tang so that it will just enter the piston ring groove. Then the tang should be filed flat at the end, instead of to a point, and trimmed off slightly at an angle, as shown in Fig. 4.

Replacing Wrist-Pin



REPLACING WRIST PIN FIG. 5

MANY motorcycle owners like to do their own repairing, and here is a method of replacing a wrist-pin which might make their work a lot easier. A tapered rod of the type shown in Fig. 5 is made from a piece of hardwood, and when it is desired to locate the wrist-pin in its bushing this rod is pushed through the opposite side of the piston and through the small-end bushing of the connecting rod. Then the wrist-pin can be slid into place

(*Continued on page* 79)

Electroplating Flowers

(*Continued from page* 57)

ring, or brooch and copies are not required, do not make castings. Instead, dip the beetle into clear lacquer and when almost dry, i. e., tacky, dust with copper-bronze powder, first treating the powder to remove any traces of grease which may be on it and which would hinder the plating, thus: put the copper-bronze powder into a small bottle or test tube and add some acetone, shake well and pour off the acetone. Dump the powder on a clean piece of paper and allow to dry.

When thoroughly dusted with the copper-bronze powder, hang the beetle up to dry (the powder is applied to render the beetle conductive so that it will be capable of receiving a coating of copper by electroplating).

The wax or plaster fish are given the conductive coating either with the copper-bronze powder or with finely powdered graphite. Brush on the graphite, using a soft brush, until the object has a black satin appearance.

The items are then ready for the first electroplating bath. Before describing this we will cover the preliminary steps for the preparation of flowers and other frail objects.

If the flower is of a rugged nature it may survive the hot wax treatment or the dusting process, but if it is frail and delicate, different measures will have to be used to render it conductive. The procedure then is to dip the flower into thinned shellac and hang it up to dry. When dry, dip into a solution of silver nitrate, ¼ ounce, dissolved in 2 ounces of distilled water, then add 3¼ ounces of alcohol.

The next treatment changes the adhering coating of silver nitrate into silver sulphide whch is a good conductor of electricity.

Suspend the flowers from the cover of a wide mouthed jar, as shown in one of the photographs. Into the jar place a few pieces of potassium sulphide, then pour into it a solution of sulphuric acid, 1 part added slowly to 8 parts water. (Do not pour the water into the acid—and perform the operation near an open window, or outside. The odor of the gas is very disagreeable. Do not inhale the fumes.)

As soon as the acid solution is poured into the jar, screw on the cap loosely—permit the fumes to escape around the cap, or punch in a small hole, otherwise the jar might explode. Allow the fumes to act on the flowers for a few minutes, then remove them from the jar.

From this stage on it is important that the object to be plated should not be touched with the hands. Any spot so touched may prevent the plating from adhering.

Attach several fine copper wires to the object firmly enough to make contact with the prepared conductive coating. Do not twist so tightly that you will bruise the specimen. On large objects, use more copper wires, because they allow the plating to be more regular.

When electroplating — depositing a metal coating on an object—direct current must be used.

A storage battery of 6 volts will be ideal. If you have no battery, a radio trickle charger and rectifier will serve. Such an item can be purchased very cheaply from a radio dealer.

As shown in the photograph, the charger is mounted on a base with a rheostat to regulate the current output. An old radio rheostat of 30 ohms may be used here. A voltmeter of 0 to 6 volts is recommended—if none is available, a battery voltmeter of 0 to 15 may be substituted. The switch shown throws the meter in and out of the circuit. The two binding posts connect the current to the plating box, which in this case was a small box obtained from the grocer. As the box is to hold the plating solution it must be made watertight. Paint the inside either with melted tar, melted wax or asphalt varnish.

Across the top rest the two dowel supports for the plates (when you are plating with copper, use two strips of sheet copper; for nickel plating use two strips of nickel). These plates are connected to the positive binding post. A metal rod is used to hold the work which is to be plated. On this rod, solder five Fahnstock clips which makes the wiring of the specimens a simple procedure; connect this rod to the negative post.

For copper plating, fill the tank with a solution of ¾ lb. of copper sulphate dissolved in one quart of hot water; slowly add ½ ounce of sulphuric acid.

The current employed should be at a pressure of about 3 volts. If the object is frail and delicate, leave it in the plating bath until covered with a sufficient thickness of copper, then remove and rinse in hot water.

If a beetle or similar hard object is being treated a more lustrous coating can be given it by further treatment.

After rinsing in hot water, brush lightly with a motor-driven fine brass wire-brush. Then plate again at from one to two volts in this solution: water, 1 quart; copper sulphate, 1 ounce; Rochelle salts (sodium potassium tartrate), 5 ounces.

When sufficiently plated, remove from the bath, wash in hot water and dry.

After being given a coating of copper an additional coating of nickel can be deposited electrically, treating in the following bath; (use nickel strips for the plates). From one to three volts will give a bright satisfactory plating.

The nickel plating solution consists of: nickel ammonium sulphate, 2½ ounces; ammonium chloride, ½ ounce; boric acid, ½ ounce; all dissolved in a quart of water.

After either nickeling or coppering, mount the objects in a suitable setting such as rings, brooches, bracelets, etc., first dipping them into thin clear lacquer to prevent oxidation of the metal shell.

Additional coloring can be given the objects after their removal from the respective baths by hanging in the following solution used in a heated condition, (about 200° F.) No frail specimen should be left in the hot solution too long as it will do more harm than good.

In a one quart jar, dissolve 1¼ ounces sodium hyposulphite in one pint of water. In another pint of water dissolve ¾ ounces of copper sulphate. Mix the two solutions together and heat.

Copper or nickeled objects dipped into this

take on a splendid range of colors, the nature of which depend upon the length of time the article is left in the bath. When the desired color appears, remove from the bath; then rinse in water, dry and dip into clear transparent lacquer.

Candid Photography

(*Continued from page* 53)

potassium salt) is added for the purpose of restraining a too rapid completion of the development process, and so prevents the development of unexposed silver grains on the surface.

So much for the action of the developer in its chemical phase. Now let us consider what happens to the negative when it is placed in the chemical solution. As soon as the film is placed in the developer all of the silver grains which have received any exposure to light whatever are changed to metallic silver at the surface of the film. This is a progressive action, the larger grains changing first and the other grains changing to silver according to their size. At the same time this is taking place the developer is going deeper and deeper into the emulsion and the same thing takes place at each step into the depth of the emulsion. Thus there is a double graduated change taking place, one depending upon the size of the silver grains and the other upon the steps upon which they lie in the emulsion. There is no such thing as a partial development of any one silver grain. It is either reduced to silver or it remains in its original condition. Thus we have the various areas of light and shade represented by the number of silver grains per square unit of area of the film determining the density of the photographic image. As we proceed deeper into the emulsion we find that the weaker lights have not penetrated here so no image is formed for those regions representing the shadows, and as we proceed into the depths of the emulsion only the brightest light has produced any effect at the bottom of the emulsion, for *all* sizes of grain. So we see that if the developer is permitted to act long enough to develop all of the grains throughout the depth of the emulsion, those parts of the film which were struck by a bright light will have a dense deposit, formed by reduction to silver of all of the grains in the entire depth of the emulsion.

If we will review the preceding statement we shall see that, at the beginning of development the image has all of its detail but it does not have a sufficient contrast to reveal a photographic image; but as development proceeds, the highlight portion of the negative becomes darker and darker so that in a short time there is a sufficient difference in the density of the deposit to give a good print. Obviously as development proceeds the amount by which the different areas differ from one another is increased; photographically speaking, the longer development proceeds the greater will be the contrast of that negative.

The numerical value of photographic contrast is expressed in terms designated by the Greek letter "Gamma." Students of photographic chemistry and advanced experimenters must take Gamma into consideration but it is a term which is at best remembered as only a name, until the beginner has obtained a thorough foundation in theoretical photography.

Developers which are actually used in amateur photography today may be divided into four groups. First there is the strong developer ordinarily used only for paper positives. This is the old so-called "M.-Q.", the type of developer which uses carbonate as the alkali. The second type of developer is the one which is most widely used today for practically all negatives of a size larger than 35 millimeters. This is the borax developed which differs from the first one chiefly in having a small amount of borax added as an alkali to replace the comparatively large quantity of carbonate in the M.Q. developer. The third developer is the paraphenylene diamine, fine grain developer usually referred to as the p-diamine. This developer, as a rule, does not contain any alkali, but in some cases a small amount of tri-basic sodium phosphate is used. The phosphate gives a more energetic developer but it has not as fine a grain characteristic as when it is not used. The fourth developer is the so-called "physical" developer which has given remarkable results in the laboratory but which has been found too unstable to be used by the amateur. In physical development the change is not purely a chemical one taking place within the emulsion but silver which is carried in the developing solution itself is deposited upon the film in a manner which is chemically analagous to silver plating.

The amateur will limit his developers to the first three, the M.Q. for his prints and enlargements, the borax for his larger negatives, and the p-diamine for his 35 millimeter fine grain negatives.

The question involved in every case of developing is the degree to which the development should be carried. This is a matter open to question as it depends upon the nature of the original subject, the film which is being developed, and the personal preference of the photographer himself. Most developing formulas are given a definite rating as to time. As development is a chemical reaction a temperature factor is always given because as the temperature increases the time required for a given degree of development becomes less. This is obvious and common to almost all chemical reaction. The mistakes of all amateurs is to adhere too closely to the published rating of time and temperature.

In the old days the photographer worked with emulsions which were not at all sensitive to red light; he took the films into his dark room and developed them under a red safe-light, watching the progress of development. He had only a vague idea of the temperature and hardly any of the time. He stopped development when his negative "looked right." We are forced to admit that the average quality of negative produced in those days, when we consider the shortcomings of the negative materials used, was greater than it is today. In those days the photographer had to know what he was try-

ing to get—today the average amateur has no idea as to the appearance of a good negative.

To help the beginner, Watkins brought out, in England, the system of developer control which was known as the Watkins Factorial system of development. In this system of development the negative was carefully watched during the initial stages of the process and the time from the immersion of the negative in the developer to the first appearance of a highlight image was taken as the index. The index was then multiplied by a factor and this gave the total time of development. To use this system it was necessary to know the factor of the developer and the factor of the particular material used so that in application it was very little better than the straight visual development.

The next system to be introduced was that which is still in common use, the so-called time and temperature development. This assigned a certain time of development at adequate temperature, and in the case of fine grain developers which are quickly exhausted, a compensation table is given which indicates a certain increase in the time of development for each roll of film developed. As we have said, this is not entirely satisfactory because different photographers desire different types of negatives; some liking a very thin and delicate negative while others like heavy, dense ones. Moreover, the different makes of film of the same general type do not react in development in the same way. Using a standard fine grain developer it has been found that some of the films on the market will develop satisfactorily in fifteen minutes while others at the same temperature require one hour, although all of the films are given the same rating in the developing tables.

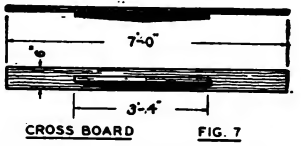
A more modern and sensible adaptation of this system is now used which enables the photographer to get approximately the effect he wants at the first trial. This system makes use of tables based upon Gamma and it is only necessary to remember that Gamma 1 is normal. Anything less than one has a lesser degree of contrast than normal while a Gamma of more than one indicates greater contrast in the negative than appears in the original.

(*To be continued*)

Make a Pontoon Sport Boat

(*Continued from page* 47)

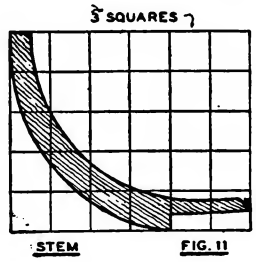
stays and the end of the stay is then wrapped tightly with heavy cord or marlin and painted (See Fig. 9). The stays on the cross-board are bolted down with the bolts through the outside ends of the cross-boards. The forward stays are bolted down to three-quarter inch thick blocks mounted on the noses of the respective pontoons.

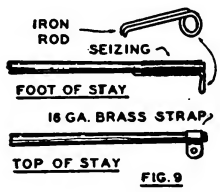


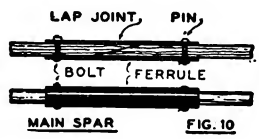
The boom of the sail is 10 feet long and identical with the spar stays. The head of the sail is supported by a spar 16 feet long. This may be in two pieces with a long ferrule on it as shown in Fig. 10. The top must, however, be the loose end. The bottom of the sail is held by a lashing from the boom to an eye-bolt in the cross-board at its center. The sail therefore pivots between these two points, and is easily hoisted. It is preferable to have the head spar and boom fastened together by a couple of metal eyes and in that way avoid a strain on the sail at that point. This is not, however, necessary.

An ordinary sewing machine will handle No. 6 duck, so you can easily make your sail. To avoid wrinkles, however, mark the edges of the cloth every 12" and when sewing make these pencil marks match. Otherwise, the bottom piece will creep away faster than the top piece. You may now make a canvas cockpit to stretch over the body frame work using grommets and heavy cord; it is easily lashed in position and will help keep you and your extremities out of the water.

The job is now complete for final painting. This boat sails fast in light breezes and makes real time in the water if you trim her carefully. A little practice will show you where to sit or stand to get the best speed for the wind involved. You will find the windward side well aft over the tails of the forward pontoons a rather good position for most breezes.





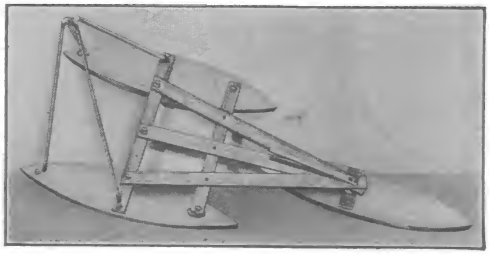


MATERIALS NEEDED

25 pieces white pine or spruce battens 1½" x ¼" x 16' for strips outside pontoons.
90 lineal feet white pine or spruce ½" thick x 3" wide for ribs.
1 piece ¾" plywood 2' square for the stem pieces.
3 feet 2" x 3" white pine or spruce for blocks under frame.
2 feet 2" x 4" white pine or spruce for blocks under frame.
8 boards 1" x 6" x 9' white pine or spruce for cross-boards and frame and keels.
18 yards 10 ounce drill for covering pontoons.
4 yards 14 ounce drill for frame covering for cockpit.
14 yards 6 ounce drill for sail.
7 pieces spruce 1½" square x 10' long for spars.
15" - 1¼" galvanized iron pipe and 3 pipe flanges.
Bolts, nuts, and washers as shown.

The boat is lively yet seaworthy and very fast. Now you may take it down, load it on the car, go to your favorite lake or river, and try her out!—A light outboard will be a useful accessory and may be mounted on the

middle board between the front and second cross-board. Then, if you have no breeze, the motor will come in handy.



Top view minus canvas deck and sail.

All Outdoors

(*Continued from page* 43)

balances the canoe against the wind; and every load in a canoe will vary this point a few inches. Moreover, it is different in every wind—depending on its intensity—and different in every canoe. This position, however, can be found in ten or fifteen strokes in any canoe with any load.

With two people paddling a canoe, and no load in the bottom, never sit on the seats, for if you do, the canoe will be very shaky. If one person is a "swing" paddler—that is, throws his body after his paddle—the righting effort of the other person may go out of time, and then one person falls out on one side with the flip of the canoe and the other person falls over the other side!

Such a situation is not bad, however, because the canoe has probably not shipped any water, so that all you have to do is to crawl back in again. Extremely spry young people will grasp the end and vault aboard. This is the hardest way. The next hardest way is to crawl aboard over the side close to the stem, as shown in Picture 3. Grasp the high side and swing up as if on a landing float and then over with your feet. For the slow pokes and heavyweights, however, the real way to get into a canoe is shown in Picture 4. Grasp the gunwale of the far side of the canoe with the left hand, or if left handed with the right hand. With the other hand, depress the gunwale nearest to you to the water's edge. Now, equalizing your weight between your arms, straighten the body out from the canoe, give a couple of good kicks with your feet and slide over the gunwale to your hips. Now roll over and your hips will slide to the bottom of the canoe; draw in your feet, and you are all right. With a little practice, this trick can be learned so well that the only water that comes aboard with no other load, you have learned this time you have learned not to swing your body when paddling; and when you have two aboard with no other load, you have learned to kneel in the bottom and not to sit on the seats.

Nevertheless, you may fall out of a canoe or tip it over, as in Pictures 5 and 6. Now you have a canoe-full of water to get rid of. If there are two of you, Pictures 7 and 8 show possibilities. Simply tread water, lift, and roll. If strong enough, you can empty the canoe. With the average canoe, most of us can about two-thirds clear the canoe, crawl in again, and bail the rest out or paddle home with it.

If alone, you are in a more difficult position, and have only one way out. This is known as shaking the water out. You grasp the gunwale amidships and while kicking the water hard with your feet, depress this gunwale slightly about a half inch or an inch below the surface of the water, push hard and let go. Actually you are pushing the canoe away from the water inside. Keep repeating and in three or four minutes you will have an almost empty canoe. Here again practice makes perfect.

Now that we have found where to put our load and how to get in and out of our canoe, let us analyze the canoe more completely. It is a wooden boat and even when filled with water will float two people. If you come up under an overturned canoe, there is air enough under it to breathe and you may come out from under at your leisure.

Never leave your canoe to swim ashore, even though you cannot empty it when overturned, or climb into it; use it as a life-preserver. If you have not practiced getting in from the water and emptying one, it will do no harm to practice.

The canoe is seaworthy in any breeze. In fact, if you become exhausted when paddling, lie flat in the bottom of your canoe and rest. You will be perfectly safe, unless you blow ashore, regardless of the size of wave.

When caught in a sudden squall and there are two of you, if the distance is far, let one person lie in the bottom of the canoe and rest while the other paddles. When he is tired, he may rest while the other paddles. Or if the wind seems high and you both want to paddle, both of you should paddle resting on your knees between the thwarts and not at the ends of the canoe, unless you have a further load between the thwarts.

When moving around in a canoe, let one person lie in the bottom of the boat before the other moves. The other person may move about carefully in a crouching position, keeping his weight over the center of the canoe.

The general practice of moving around in a canoe, however, is bad and is to be discouraged, but may be done in emergency if proper precaution is observed. Probably the worst task is to move from the front seat back. Let one person lie in the bottom and then the person in the front seat can slide backwards, slipping down over the thwart to the bottom alongside the person on the bottom. Then one person may resume a paddling station. The best place to make canoe seating changes is at the dock. Nevertheless, the canoe is stable and dependable in almost any weather if it is treated with due consideration as to its requirements. In fact, a skilled canoeist can even stand on the gunwales of a canoe and paddle it even with waves two feet high.

One capable canoe-handler who used to practice paddling out to meet the boats that went up and down the river would stand upright in the bottom of the canoe, taking the waves of these river boats while standing. It required skill but did give the young man a

sense of balance. This same person insisted that he had much more confidence in a canoe than he had in the average rowboat because, he said, "if you become a part of a canoe, it will withstand any condition you adjust to while with a skiff you must take it as it is and it has very definite limits of ability.

Now for a word about paddles and paddling. Many people do not use the canoe paddle to advantage. I have been shocked to find people using canoes with five- and four-foot paddles. Those lengths are all right for children, but an adult cannot reach the water with a four-foot paddle. Standard equipment of a canoe should be a six-foot stern, and a five-and-a-half- or five-foot bow paddle.

Do not swing on the paddle. The proper stroke is an easy forward reach, a downward dip of the paddle, pulling aft with the lower hand, holding the paddle nearly vertical with the upper hand, and if you must swing your body, swing it fore and aft but not sidewise. Balance is the keynote here.

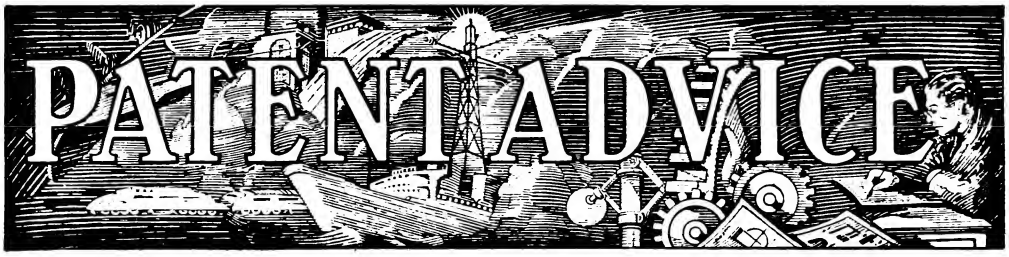
Steering a canoe is simple with the stern paddle and, properly done, is a part of the paddle stroke, not an afterthought while the bow paddle makes a couple of extra strokes, or while you lose the advantage of your stern stroke.

I will try to describe a stern paddle steering stroke. Dip your paddle and stroke. As the paddle comes back abreast of your hip, turn the edge that is toward the canoe slightly toward the stern of the canoe and keep turning until at the end of the stroke the paddle is in the steering position; i.e., the blade is parallel to the stern of the canoe. All the time you are turning the blade, push slightly outward and at the end of the stroke if necessary you may give a slight kick to the paddle by pulling with the hand at the top of the paddle, letting the paddle itself hit the gunwale of the canoe.

Such a stroke, varied according to the conditions to keep the boat straight, is most effective and to the casual observer does not even seem to be a steering stroke. In fact, the stern paddle may work as fast as the bow paddle. When alone, this stroke is very valuable, especially in a breeze, for it allows continuous stroking, since the steering is completed with the stroke and trailing of the paddle for steering is not necessary.

A canoe is lightly built and long life depends upon care. Do not drag it up on the beach or let it rest upon rocks. Whenever possible, land at floats or on grassy shores and always lift the end and float it onto the beach instead of dragging it along. The canvas will last much longer and not be torn as easily.

Finally, you do not drive your car around a corner on two wheels or drive with the doors open or with flat tires. These things you consider dangerous and not conducive to getting the best results from your car. If you treat the canoe with as much consideration as you do your car, observing the laws of weight placement and the effect of wind on the side of your canoe, you will find you have a safe, dependable, useful, and reliable craft. Your canoe is what you make of it and if you will make it cranky, tippy, and hard to paddle, it is not the fault of the canoe.



Conducted by Joseph H. Kraus

Since 1919 the Editor of this publication has given Patent Advice to many thousands of readers through the pages of several leading popular scientific magazines. Never has any question of honesty or integrity been raised. The Editor always writes what he believes to be the truth, without fear of what Mrs. Grundy may say or think.

In this department, which is now published every month, only such matter as is of general interest to inventors will appear. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries will be published here for the benefit of all readers. However, if the idea is thought to be of importance, we make it a rule not to divulge all details in order to protect the inventor as far as it is possible to do so. In many cases where patenting procedure is recommended the letters will not find their way into these columns.

Should advice be desired by mail a nominal charge of $1.00 is made for each letter. Sketches and description must be clear and explicit, only one side of the sheet should be written on and inquiries should be sent folded, not rolled.

Before mailing your letters to this department, make sure your name and address appear on the letters, drawings, and envelope. Please address Patent Editor.

Corn Remedy

Mac C. Hopliman, Philadelphia, Pa., states that he made a preparation for removing corns consisting of two chemical ingredients which are patented and two which are not patented and that the product performed its work in one treatment. He wants to know if he could manufacture it for sale.

Answer: We feel quite sure that the chemical houses which have the patents on the materials used in your compounded corn remedy would be willing to supply you with the chemicals because it would mean a greater sale for their products. In view of the fact that neither of the materials have ever been used for the purpose you propose, it is not likely that there would be any interference in your plans. We would recommend that you write the chemical supply houses and tell them frankly that you intend to place a new product on the market as a corn remedy which in part will use their preparations and ask them to quote prices of the chemicals in quantity.

We are of the opinion that if your product will do what you claim for it, it will meet with instant success.

Water Temperature Control

Ambrose Gustafson, Braham, Minn., submits a diagram and specifications of a thermostatic mixing valve for shower baths and the like. He wants our opinion as to the value of the product.

Answer: For two reasons, your thermostatic control is impractical. The first is that the average thermostat cannot operate a rather tight fitting valve, which seems to be required in your controlling device; the second, and most important, is that a thermostat does not respond instantly.

We feel confident that if someone would develop a cheap mixing valve which would control the temperature of water to within five degrees above, or below, the temperature at which the valve is set, the organization manufacturing this product, and the inventor responsible for its development, will profit thereby. We recommend that you work upon the plan further. It is a good item to try to perfect, but do not think that your present mechanism is suitable for the purpose.

Automobile Anti-Skid System

A. Van Zyden, Darby, Pa., states that he has developed a mechanism which will prevent automobiles from skidding in icy weather. He wants to know what to do with it.

Answer: It is very difficult for us to comment upon any system when we know nothing about the nature of its construction or assumed operation. We would recommend that you draw up plans and specifications and submit them to a recognized patent attorney requesting him to search the patent records for any similar product. If you find that a patent could be obtained, and feel confident that your system will operate satisfactorily, and further, if this system could be applied as an attachment to any existing car at a cost commensurate with the duties it performs, it might be recommended that you proceed further, protecting the idea with a patent.

Wind Power Device

T. Kempling, Drumheller, Alberta, Canada, furnishes us with a drawing and specifications of a wind-driven air compressor provided with a storage tank for housing the supply of compressed air until it is ready to be used to operate a turbo-generator, pneumatic tools, etc. He wants to know whether we consider the idea practical.

Answer: We do not see anything practical in this method. As soon as a certain pressure is built up in the storage tank, the wind-driven pump will refuse to function because of the terrific back pressure. Inasmuch as there are always losses in transferring energy from one form into another, it would be folly to first compress the air and then use it for the operation of a turbo-generator; the same generator could have been operated much more efficiently by the wind directly. It is also more practical to store the energy in storage batteries than in a supply tank. We see no advantage to be gained by your method.

Music Rack Improvement

Frank Rahija, Kansas City, Kansas, proposes a simple system for increasing the general usefulness of a music stand. He asks us to comment upon the same.

Answer: In accordance with our avowed principles, outlined at the head of this department, we are not disclosing the nature of this product. We are of the opinion that if properly handled, this article should meet with a reasonable sale. It is simple and cheap to manufacture, and could be sold at a price low enough to make it interesting to every musician. We would recommend that you request your attorney to have a search instituted and, if the path is clear, further action would be advisable. We wish you the best of success in commercializing this product.

Vacuum Addition Increases Efficiency

(*Continued from page* 69)

tube improves the performance of a vacuum cleaner. Without it, the dirt soon packs over and within the pipe opening, offering much resistance to the incoming air-blast and cutting the efficiency of the machine. An extension permanently riveted to the short pipe neck, instead of one held temporarily in place by the usual bag clamp, may be used. With this additional unit, frequent emptying of a partially filled bag is unnecessary.—T. L. MOORE.

Tips for the Motorcyclist

(*Continued from page* 72)

as it is guided by the wooden rod, which it pushes out before it.

Warping

TO prevent warping, never remove the cylinder head of a motorcycle while it is real hot.

New Fishing Book

OZARK RIPLEY, world-famous author of articles on fishing, has written a new 130-page book about his lifetime in the forests and on lake and stream. No other outdoor writer has a larger following. His fishing experience covers every state in the Union, every province in Canada—as far as the Hudson Bay region. He has fished in the trout and salmon streams of England, Scotland and Ireland; he has tried his skill in Mexico and South America.

If you would like a copy of this interesting booklet, write to Box J, MECHANICS AND HANDICRAFT Magazine, 9 South Clinton Street, Chicago.

Refrigeration Servicing

(*Continued from page* 66)

spect the evaporator for frost or sweating condition. Check the suction line. Is it too cold, frosting or warm? Feel the liquid line. Is it normal or too warm? Apply the gauge test set and check the charge. Is charge correct? Check back pressure and make sure back pressure setting is correct. Is the thermostat or pressurestat in order? Put a thermometer in the box and see if temperature is correct. Check the motor. A hot motor indicates long operation, overload or a faulty motor. If it is cool, it should be all right and shows the load to be light or normal.

4. *Analysis of symptoms.* The next step is to balance your findings or symptoms against

the complaint. Do they check up. For instance, a dirty condenser will cause long running, hot motor and big bills; in a hot kitchen it will also result in poor refrigeration. Review the symptoms and troubles outlined in the previous installments. Do any other symptoms or troubles seem to apply? Some times there will be two or more little troubles existing which, combined, will result in poor operation.

5. *Mechanical correction.* Now is the time to make use of your tool kit. This may involve cleaning condenser, resetting pressurestat, thermostat or expansion valve; bleeding air or refrigerant; adding refrigerant or oil. Sometimes it is just that the evaporator has a heavy coating of ice on it or a new door gasket is required, a blown fuse needs to be replaced or a new belt is required.

In many cases it will be necessary for the service man to check the system the next day to make sure the expansion valve, thermostat or pressurestat is working properly.

The schedule of charges is of interest to the man who intends to enter this field of endeavor to make his living at it.

Probably the first important note pertaining to charges for service work is: All work should be C. O. D. Your charge may be a small one and, regardless of the owner's financial standing, you cannot afford to carry him on your books on the due and owing side of the ledger.

One concern in New York City will not service a job until the previous bill is paid, if it be due for more than the current month. If more than a month old, they do not service at all, figuring the customer is bad pay and that in the end they will only lose money. This organization guarantees their work, and stands back of it; therefore, they can be somewhat independent.

Prices for jobs will vary with the locality. As a rule prices range from $1.50 to $2.00 per call in large cities. This is for minimum time per call and it includes a traveling time of 15 minutes and 15 to 20 minutes in the user's premises. Any time over this period is usually chargeable at the $1.50 to $2.00 rate, broken down into 15 or 20 minute periods. Thus, if a service man spends up to 15 minutes going from one job to the next call and he clears up the job in 15 to 20 minutes, his charge would be $1.50 to $2.00, depending upon the rate he selects to work under. Now, if it be necessary to spend an extra 15 minutes on the job, one-quarter of the hour rate would be added to this bill.

All materials, including replacement parts, gaskets, oil, refrigerants, belts, motors, trays, door gaskets, etc., should be marked up 50 per cent of the service man's cost.

Do not cut prices on material or on time. If you once start with low prices you will find it very difficult to ever raise your fees. Customers will feel hurt and deal elsewhere.

Again you would not like it if you had an established business to find some newcomer entering the field and underselling you.

Adhere to your price schedule and do good work. Neither you nor the customer will lose by it.

Some organizations make flat rates for certain jobs. A few of the more common rates are as follows:

Furnishing and installing a new ⅛, 1/6, or 1/5 H.P. motor, taking in old motor in exchange—$18.00.

Furnishing a rebuilt, or rebuilding a ⅛, 1/6, or 1/5 H.P. motor, taking in old motor for rebuilding or exchanging—$13.00.

Furnishing and installing a new ¼ H.P. motor, taking in old one in exchange—$19.00.

Furnishing a rebuilt, or rebuilding a ¼ H.P. motor, taking in old motor for rebuilding or exchanging—$14.00.

Installing and furnishing a thermostat—$8.00.

Removing and installing new single cylinder compressor, taking in old one in exchange—$17.00.

Removing, overhauling and reinstalling a single-cylinder compressor—$11.00.

Removing and installing a new double-cylinder compressor, taking in old one in exchange—$21.00.

Removing, overhauling and reinstalling a double-cylinder compressor, taking in old one in exchange—$15.00.

The service mechanic usually finds it best to make his charges on a time basis, for when one trouble has been corrected, another may be discovered, which requires additional time. This system is fair to both worker and owner.

As a rule, the following jobs can be done in a half hour: Adding oil—belt replacement—installing a new pressurestat or thermostat—replace fuse and check for trouble—replace a motor.

The following jobs generally require an hour: Charging with refrigerant—pumping down a dry coil—pumping down a dry coil and installing pressurestat—replace an expansion valve (no setting)—strainer removed, cleaned and reinstalled—or a new strainer installed—compressor removed or installed—change a compressor seal—replace gasket—renew a flare—replace a compressor valve, or install a dehydrator.

The following involve about two hours' work: Replacing a compressor on a "stuck-up" job—replace an evaporator—new liquid or suction line.

Pumping down flooded low sides requires about three hours, such as where a new needle, ball or cartridge is required.

The above data presents a picture of charges and time involved. To the service man it represents a basis for charging for the jobs he does; to the owner and man just interested in mechanical things and not desirous of doing the work on his own machine, it gives an idea of what he might expect to pay for such work.

Most persons entering a business think all they have to do is to hang out a shingle and that customers will just come in droves.

First you will have to get some experience in the servicing field. Next a shop will have to be rigged up. True, it may be in the basement or out in the barn, but a workshop must be set up. One great mistake is to build some rickety contraption called a work bench. This is a waste of time, for it will cause immense annoyance and probably fall apart just when you're busy.

Build a good sturdy bench, at the proper height so you can work comfortably. Use 4" x 4" timbers, preferably bolted together, with a good 2-inch top. Then mount a good big vise on it; the swivel type is best.

In regard to tools, you can never have too many, but again, a good worker can get along with fewer tools than another worker. The tools not carried in the service kit are best mounted on a tool board, using hooks, nails or screws—then you can find them.

You may only need to use a tool for a matter of seconds, but if you are careless it may take you many minutes to find it among a mass of tools piled up on the bench or in a box.

You will have to have cards printed, giving your address and phone; the latter is the most important. The person who needs service is not interested in a lot of verbage stating "good work, cheap prices, prompt service," etc.

It is an excellent plan to have stickers made up, with a good grade of glue. Attach or stick these inside the machine compartments or on a beam close to the machine if it is in the basement. The owner will then be able to find it. Blotters are a waste of money, for they are used and thrown away, never kept or on hand when service is wanted.

Circulate in your neighborhood and find out those people who have machines. You have to go after business and build it up. Then trade will come in to you. Remember your basic fundamental of business—render good work and stand back of it. Make people want your kind of service work.

Wedge-Shaped Crystal Perfects Radio Reception

(*Continued from page* 39)

All selective properties of the tuning circuit have been retained but the "frequency slice" which one can cover for any part of the waveband is as broad as the designer desires. In short, despite the extreme selectivity, the lowest pipe of an organ as well as the highest soprano voice can now be reproduced faithfully.

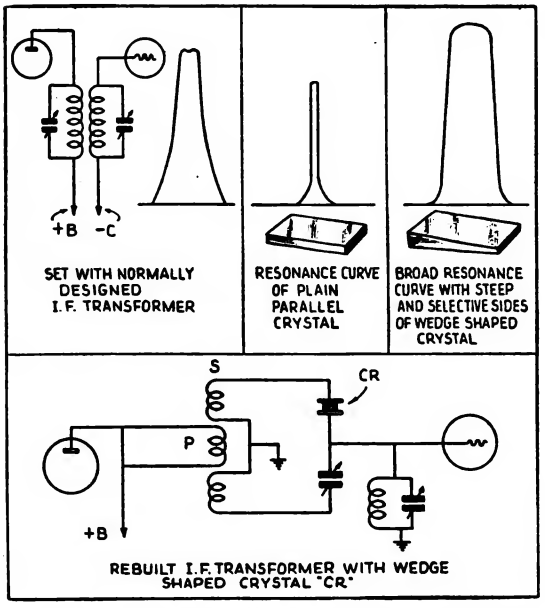
How this valuable trick has been achieved is shown in Fig. 1. Instead of using the common parallel-ground crystal, Mr. Guerbilsky uses a crystal of wedge shape. Heretofore crystals of this type were thrown away, or sold as "seconds" because they did not resonate sharply enough.

Investigating the frequency characteristics of wedge-shaped crystals, Mr. Guerbilsky found that if they are given the proper shape these crystals could be forced to resonate at a great number of frequencies. Since these frequencies are very closely related, a frequency band of the desired width can be "cut out" from any wave spectrum desired.

The crystal shown for photographic demonstration exhibits an exaggerated wedge-shaped form. Actually the wedge angle is very slight. Mr. Guerbilsky incorporated such a crystal into one I.F. transformer of a custom-built "superhet" as shown in Fig. 4 and improved the overall characteristic of the set to about 500 percent. Music and speech was reproduced

with full band width (on short waves), without interference from adjacent stations.

The I.F. transformer is of customary design but connected like a simple bridge circuit to make possible the trick here described.



This diagram explains the advantages of the wedge-shaped crystal, and shows its hook-up in the circuit.

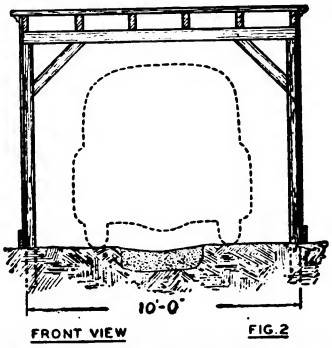
Car Shelter for Cabin

(*Continued from page* 49)

nounced slope or pitch is advisable.

It is not necessary to paint a structure of this kind because it can be covered with vines quckly, also, the exposed wood will be more attractive in the weathered state. Along the center of the dirt floor excavate a pit eight to ten inches deep and about 24" wide, and fill with cinders, gravel or sand to absorb oil drippings.

Give the vines every chance to thrive by filling a two-by-two-foot hole with rich soil, apply fertilizer and humus on top, especially if the cottage is located on sandy soil.



Car shelter gives plenty of clearance both overhead and at the sides even for a large automobile.

Flying the Arctic

(*Continued from page* 28)

Airplanes today are indispensable in a nation's economic life. This is true anywhere, but in Alaska most of all. Books could be written about the adventurous pioneers who fought and grappled with the merciless North, dodging its cold blasts, outwitting its dangerous tricks. In this brief article, we will seek but a glimpse into the life of a pilot flying the Arctic. They had to learn a few tricks themselves, and flying the Arctic is unlike flying anywhere else.

People who do not know how strongly an airplane is built might not believe it, but most of the ships now flying in Alaska are close to ten years old, and still going! Most of the "airways" operating in Alaska are highly individual enterprises, and consist of one airplane and one pilot. There are a few larger organizations, boasting half a dozen

Haines, Alaska, is at the right. At the left is Fort Seward, the only army post in Alaska, with about 200 enlisted personnel and a few officers. The fort was named for W. H. Seward, who, as Secretary of State in 1867, brought about the purchase of Alaska for $7,200,000.00. Since then this territory has exported over a bilion dollars' worth of merchandise and gold.

Engine cover and "nightgown" to protect the airplane from frost are shown applied to this Lockheed Electra of the Pacific Alaska Airways.

ships. And there are, now, Pacific Alaska Airways which bind the country with the United States. There is room, work, and adventure for all.

Take such a little matter as footwear. If it is not too cold, say about 20° below zero, the thing to wear is a pair of heavy oiled-leather boots. They are waterproof, and there is no chance of the snow melting on the boot and seeping through. But it gets colder, much colder,—60° and 70° below. The oil in the leather frezzes solid, and the boot is useless. Then, in that dry cold, you put on a dry leather boot, which would leak like a sieve in warmer temperatures, but remains pliable while mercury freezes. (By the way, thermometers in Alaska use pure alcohol, which does not freeze as readily as mercury).

Now, just picture for yourself what an airplane engine has to do when the thermometer reads 60° below! Starting an engine is a matter of careful hours of preparation. The oil had been drained from the engine the moment the pilot landed, and even as it poured from the crankcase it was congealing to the consistency of marmalade. That precious can of oil is the pilot's chief concern. He takes it with him into his sleeping bag, to keep it warm for the next day, and as he makes his breakfast he will give it more attention than his coffee. Meanwhile, a heavy canvas tent had been hung over the engine, and a blow-torch had been roaring for a couple of hours, sending the hot air up to warm the frozen metal. The engine is warm —more or less. A few final caresses with the blowtorch flame directly on the metal and the crankcase plug spun open, and the hot oil poured in. She starts! On a good cold day it may take five hours work to start the engine and bring it up to the operating temperature!

That ship stays in the open most of the year, changing only from wheels to skis and back again. The biting cold freezes the very marrow of the steel and fabric, and if the pilot had a warm hangar where to put it, he would ruin the ship! The temperature shock would be too great even to the inanimate metal.

When Pan American started their operations, they had to build special hangars with what one might call a "defrosting" chamber. The airplane is first taken from the outside's sub-zero temperature into one end of the hangar. All doors are closed, and the *freezing* temperature maintained there by heaters gradually thaws the airplane to the freezing point! Six or seven hours later, the inner doors are opened and the ship is taken into the workshop where the heaters keep the temperature at an even 60 degrees — above. With the work finished, the procedure is reversed.

Likewise, an airplane must be protected against ice—not the kind of ice that forms in flight, but the fine rime that condenses while the ship stands on the ground. It must be carefully brushed (sometimes chipped) from the fuselage and wings. For this reason, many prefer to carry a "nightgown" for their ship—and certainly keep one at the airplane base; this consists of a set of slip covers

for the wings, engines and propellers, and another sheet or two to fit over the fuselage.

If an expert were to tell you all that should be done to maintain an airplane's skis, he could talk for a week without repeating or wasting words. Most of that information you would need once in a lifetime, but if you did not have it—well, your lifetime would likely come to an abrupt end. Most pilots jack up their ships free from the cold ice, lest the pressure of the airplane melt the ice or snow to freeze the ship fast. If that happens, it is not enough to chop it out: the bottoms of the skis must be cleaned off as well.

Operating aircraft radio is a problem in itself; if a dynamotor is used, the oil congeals to such an extent that it is frequently rendered inoperative. Therefore, many prefer a vibratory type of power pack, mounted handy to the pilot so that he can give it a whack if it stops! And even when you do get your radio going, you are bound to hear the aurora borealis instead of the station to which you are trying to listen!

A thousand perils lie in wait for the timid and the inexperienced in the frozen spaces of the North. Yet that mysterious something that makes us all tick, pushes our men on to new conquests and new frontiers.

Man Nears Automaton Era

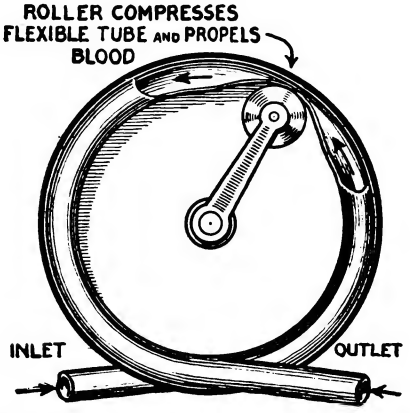
(*Continued from page* 33)

which the heart muscle and valves are subjected, but an artificial heart could be replaced—the natural heart cannot. And those marvelous filters, known as the kidneys, already have found mechanical substitutes.

Let us just see what modern surgery could do to a human organism—and has done in countless isolated cases. Up to the present time no one has found a substitute for hair on the head, but it is probable that in the very near future a hairy scalp could be grafted in place just as skin is being grafted today. The partially deaf have had their hearing restored by modern electrical sound detectors and amplifiers. Thus, people without earlobes, external auditory canals and without the bones of the ear or the eardrum, can be made to hear, by employing hearing aids which apply the simple principles of bone conduction. Defective eyes are corrected by glasses. Cataracts are removed surgically. The cornea has been grafted into human eyes and while frequently it has been obtained from other humans, successful transplanations have occurred from the eyes of pigs. Assuming that vision is completely obliterated, a blind person can still read printed books by using an instrument known as the optophone which translates the printed characters into variations of sound.

Photo courtesy of Western Electric Co.

The deaf are being helped by this latest hearing aid in which the receiver acts upon the bone in back of the ear and the amplified sounds are rendered audible by bone conduction.

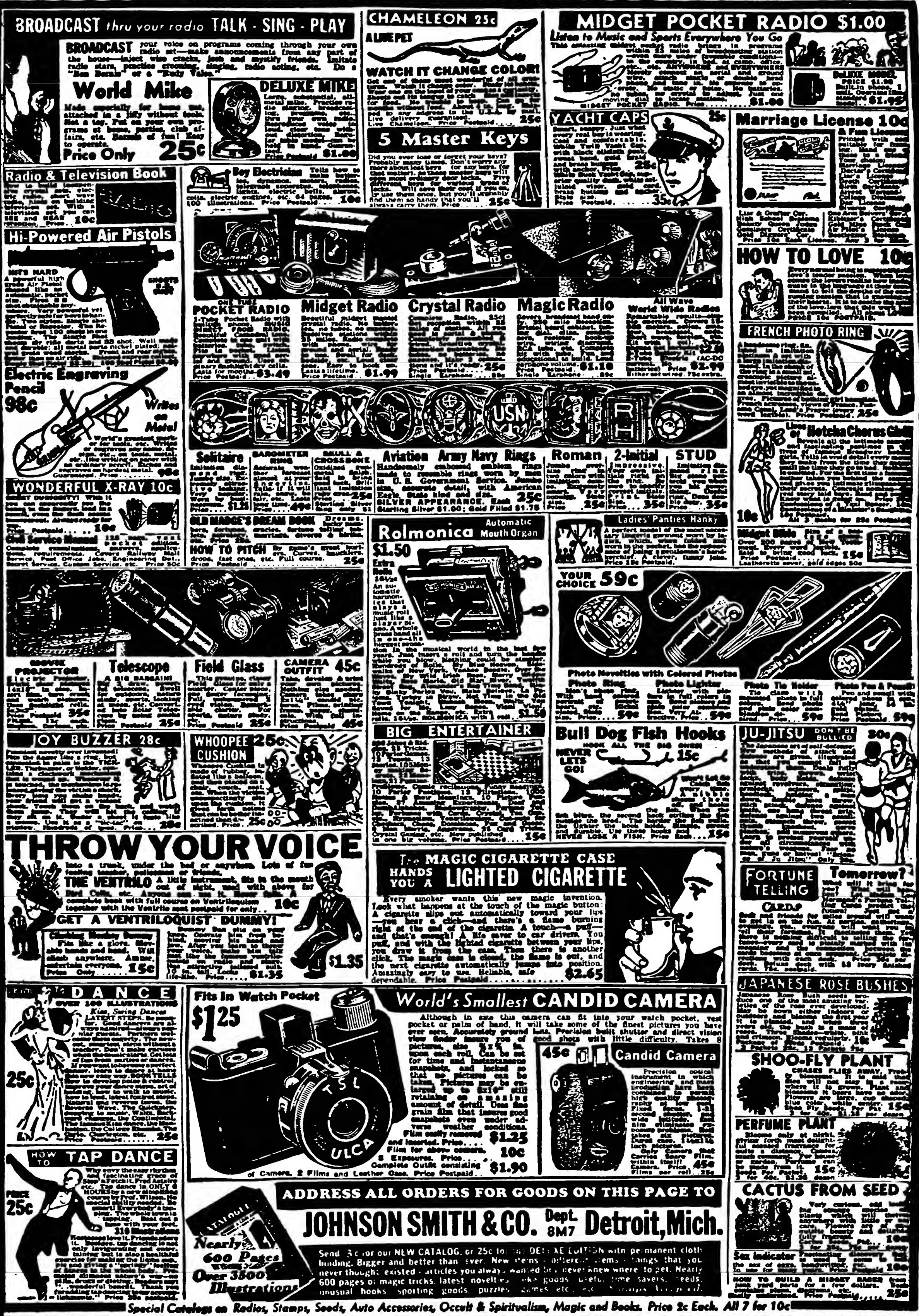


Of all the machines for intravenous injections, the latest known as the "Rotary Apparatus" incorporates the following principal advantages not included in other models, namely, that it can be kept in operation for an indefinite period of time, without stops for either adjustments or for re-filling, since both these needs can be met while the rotary apparatus continues to function; and that being based on the "rotary" principle, it functions without either pistons or valves which are disadvantages which form a part of other models. The "principal advantages" as stated above are such that their importance cannot be overemphasized. This diagram shows the method of operation.

Modern plastic surgery has worked wonders with the nose even building up a nose where none existed. Nothing can be done to increase the olfactory sensation when once this is destroyed. Substitutes for the jaw and teeth have been produced and it has frequently been found necessary to remove the tongue surgically. When doing so, the larynx is sometimes destroyed (or it may be necessary to remove this section of human tissues for other reasons). This destroys the "voice box." Here again science has come to the aid of the unfortunate by producing an artificial lung with a vibrating reed. As will be seen in one of the photographs, the user holds this under his arms and operates the bellows. The reed produces an intermittent gutteral sound easily modulated by changing the position of the mouth. The result is that a person without vocal cords can talk so that he can be understood (of course, the vibrating reed is held between the teeth much like the bit of a pipe).

We are all familiar with artificial limbs; sometimes these limbs are so arranged so that they can be manipulated by fragments of muscle still attached to the torso. The surgical removal of the stomach and most of the intestines, with the exception of a few feet, has been recorded; and there are many persons living who have but one lung or only one

(*Continued on page* 97)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Paralyzed with Fear?

(*Continued from page* 31)

point of the beak to a distance of two feet and the chicken will remain there, immobile, until it is disturbed. The contention is that the chicken's eyes, fixed upon the white chalk, become hypnotized with the movement of that chalk. Experiment will indicate that the same effect can be produced without using the chalk.

Again, a frog is very easily hypnotized by flopping it over on its back, holding the hand there for just a second and then removing it. Apparently the frog "feels" as though it were being held in the upside down position. Lizards, alligators and some snakes reach what seems to be a cataleptic state by similar methods.

The American crayfish, when spun around two or three times on its back, will become rigidly motionless. One can do anything with the creature in this state without exciting any movement, and again no hypnotic power was exerted. On the other hand, there are many animals which become rigid, motionless and feign death for practical reasons, namely, those of self-preservation. Some beetles, the ladybugs, some caterpillars, and many other creatures play 'possum when frightened by sounds or when touched by an unfamiliar object. But animals of the lower orders are not the only things that become paralyzed with fright.

No doubt many of the readers recall their childhood nightmares in which some apparition caused them to become so frightened that their muscles refused to respond. They tried to run away from the "demon," only to find that in their dreams they fell to the floor, crawling away as rapidly as their leaden feet and "clubbed" fingers would carry them. As they grow older, however, such nightmares are relegated to the discard, along with other thoughts of childhood; and the same hobgoblins are no longer awesome. Nevertheless, temporary or even permanent paralysis caused by the dread of something real or imagined, frequently occurs in adults.

When next you see a hypnotist waving his hands over the body of an alligator, cat or rabbit, just remember that there are no mesmeric passes which cause the animal to remain in the lethargic state. Instead, the poor creature is frightened half to death.

Cardboard Models

(*Continued from page* 63)

cardboard is glued; this measures 1-9/16" x 2⅜".

Glued to this piece are the sides of the tender. Half of the full pattern is shown at Fig. 16. This is best made in one piece bent over and glued at the seam. When finished and glued to the flat bottom it should be a box 1½" x 2". The borders around the edges are cardboard ⅛" wide, and are glued on after the box has dried.

The axle holders are glued to the frame on the outside (in the same manner as the locomotive) ½" in from the ends of the frame.

The ⅝" diameter wheels have eight spokes 1/16" thick and 3/16" deep mounted around a ⅛" diameter hub. They are placed on wire axles ⅝" long. No tape is used on the tender axles. They are held in position with a 1/16" square piece of bamboo, 1-3/16" long, glued to the bottom of the axle holders. Springs may be carved from bits of balsa, and inserted between the frame and the flat piece of cardboard that forms the bottom of the tender.

The couplers are made of wire and should be placed front and rear. They are bent in shape and glued securely in position.

Paint the tender yellow with green borders. The frame should be black as are the wheels. The rims should be bordered with red. Wood in the tender can be represented by ordinary wooden match sticks glued between the tender sides. The match sticks should be given a coat of dark stain.

The coach (Fig. 17) is built up on three frames of balsa or bamboo 1/16" square. Upon these frames the cardboard body is mounted. The full size for the sides is given in Fig. 18. The body may be built in four separate sections or made in one piece and folded over the same manner as the tender, (Fig. 19). The front and rear pieces measure 2" x 1⅜". The windows, however, are cut out with a razor blade before the body is glued together. Short lengths of 1/16" square may be glued in place to represent the window frames.

Assuming now, that the body is glued, two

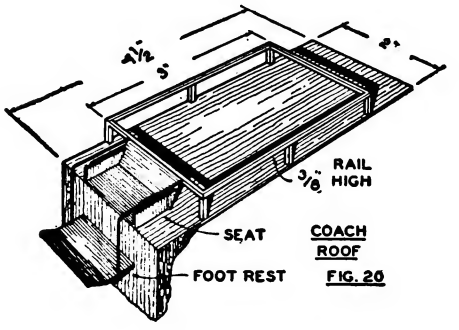


FIG. 20

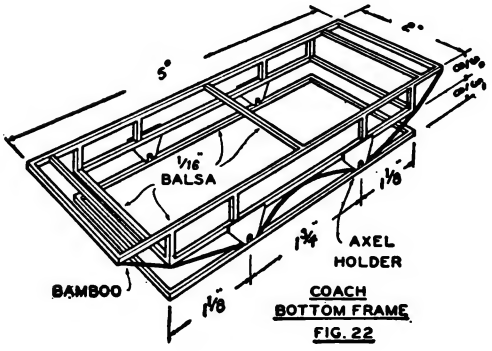


FIG. 22

cross-pieces of cardboard 2-15/16″ wide and 1½″ deep are inserted between the sides as shown on the plan.

When the cross-pieces have dried in position the top (Fig. 20) is put on. It is a flat piece of cardboard 2″ x 4½″ long; it is glued to the top of the body.

On top of this piece a small frame or baggage holder is built up of 1/16″ square balsa. It is 2″ wide and 3″ long. It stands on six legs each 5/16″ high. There are two seats, (Fig. 21) made of cardboard, folded to shape from the patterns given. Glue them to the front and rear of the top.

Directly in front of the seats and ½″ below them is a foot rest or platform. It is a piece of cardboard 1¼″ wide and ⅞″ long. Bend the front up slightly and glue in position. Then add the copper wire arm rests as shown.

The three frames that form the chassis are built of 1/16″ balsa to the size given in Figs. 21 and 22. Little clarification is needed, for they are all constructed in the same manner. Be certain that each frame is dry before attempting to mount it on the other—mount only one at a time. Begin by gluing the first frame (the one with the four cross members) to the bottom of the coach, and then proceed by adding the other frames below this.

The wheel holders are glued about ⅞″ in from the end of the middle frame. The wheels are ⅝″ in diameter and are built up in the same manner as the other wheels. The axles are wire 2″ long. Tape is wound about the axles, between the wheel and frame to prevent sidesway. Allow enough play for the wheel to turn freely.

Glue strips of bamboo between the lower and middle frame as shown, but be careful not to split the wood.

Paint the body yellow with a black top and frame. The wheels are red. Couplers are made of copper wire bent to form a loop. Details, such as lettering, or designs painted on the sides, may be taken from old prints, of which many are to be found.

Mount the train upon a standard "O" gauge rail set upon a wood base colored brown and green to represent the earth. Take plenty of time with the model for it is well worth careful construction.

Machines Decide Your Career

(*Continued from page 36*)

of every hundred people the sort of work to which they should apply themselves. Out of 375 tested by such equipment, 350 have made a striking success of the vocations for which they had been judged suitable.

The photographs on these pages were taken at the National Institute of Industrial Psychology in London. As a result of their tests, many prominent firms, realizing the possibili-

ties that lie in vocational tests for the selection of a proper staff, have called in experts to analyze the work being done, to find out the special aptitude required, to place these requirements in order of their importance and to suggest mechanisms which would give a record of the applicant's subconscious interest, rather than his trained technique. In Fig. 1 we see a test board that is designed to demonstrate manual dexterity. A person doesn't have to have a brilliant brain to manipulate his hands. Determining the length of time to run the thread through the eyelets on the board, determines the aptitude of the applicant.

If your abilities are of a constructional nature, you are given a number of colored cubes with which, within a certain time, you are expected to produce a certain pattern. For inventive genius, a test board (Fig. 3) shows a number of knobs. One of these is pushed down by a mechanical hand; the other knob or knobs move up, down, out or in. Beneath the test board is a layout of the possible lever connections. By keen analysis, you are expected to judge the type of lever connection employed in back of the test board to reproduce the motion of the knobs.

For weavers, it is necessary to determine their manual skill. Threading a long needle through small brass rings, corded to a frame, determines their efficiency (Fig. 4).

A test of mechanical aptitude is determined by a rather complicated machine illustrated at Fig. 5. You turn the crank and various things happen. You are then requested to analyze the action and tell how you would change the mechanism to produce different results.

If you consider yourself to be a good lathe worker, you are presented to a machine provided with two handles similar to those one finds in a conventional metal worker's lathe (Fig. 6). Instead of a tool, there is a pencil which rests upon a plate to which a printed paper diagram has been attached. The test consists in producing circles within the printed circles by manipulating the two handles simultaneously.

If you can draw straight lines with a soldering iron, tinsmithing may be your vocation—or you might become a sign painter (Fig. 7). To test a person's reaction to unexpected technical difficulties, a dotting machine is used. Here a roll of paper passes under the eyes of the observer. He must press his pencil on every dot that comes up before him and which is out of line from the normal straight path (see Fig. 8).

Turning the handle and operating the sewing machine, a good operator can run the paper ribbon through the machine and follow the printed line on that paper (Fig. 9).

As a result of these experiments, psychologists frequently find it possible to make minor changes to expedite progress of the workers. (Refer to Fig. 11.) Both illustrations indicate celluloid brush polishers. The one at the left must make too many movements to complete each task. At the right, operation can be completed without interrupting the work or without the necessity of bending down to pick up one piece or stooping over to deposit the finished article.

How to Build a One Tube A.C.-D.C. Loud Speaker Receiver

(*Continued from page* 59)

D.C. Of course, the plug must be inserted into the D.C. light receptaele properly, with due regard for polarity, before the receiver will operate from this type of power supply.

A line cord with 300 ohms resistance (or 290 ohms will do as well) is employed for dropping the 110 volts to the required 25, for satisfactory heater operation. The crystal detector preferably should be of the fixed type, since continuous adjustment of the crystal detector would be a nuisance and spoil the simplicity of its operation. However, in this respect, it must be emphasized that a good sensitive crystal detector is essential for normal or good operating efficiency of the receiver, and it may be entirely possible that poor results will first be obtained until a good fixed crystal detector is finally obtained. Frankly, this author had to keep exchanging the detector until he finally obtained one that compared to the efficiency of the variable type which was employed for the tests and comparisons.

Another pertinent point is the differences in various types or makes of 25A7 tubes. For some reason they vary in characteristics somewhat, necessitating, in some instances, a 1,000-ohm value cathode-biasing resistor in place of the 625 ohms specified. This change may make a tremendous difference in the gain or sensitivity of the receiver, and it is suggested that all those who construct this receiver try the 1,000 ohm value for comparison.

Regarding the actual layout or construction of this receiver, the photographs illustrate how the sample was made, but by no means serve to indicate the precise layout or style to follow. The constructor may build the receiver on a larger or smaller chassis, or even on a breadboard if he so desires—just so long as the two tuning coils are kept apart to minimize reaction, an dall other parts are not so far apart that long leads result. The values specified for resistor and condensers are rather critical (with the exception mentioned) and substitution by other values is not recommended. A magnetic speaker, or permanent-magnet dynamic type, may be substituted for the type shown in the diagram, providing the constructor is familiar with the manner of wiring it into the receiver circuit in place of the one used here. Concerning the cabinet employed in the receiver shown, it was picked up in a radio parts store and undoubtedly will not be available to the majority. However, as mentioned, this item is not at all important, and the constructor may secure any cabinet that pleases his fancy—providing he can also secure a chassis that is suited for it.

The only adjustments necessary, when the wiring of the receiver is completed, is that of "dressing" up the trimmers on the gang condenser. These trimmers should be rotated or adjusted with a suitable aligning wrench so that perfect synchronism in tuning is obtained no matter at which end of the dial a station is tuned-in. This is accomplished by adjusting

the trimmers for maximum signal volume on some station tuned-in about the middle of the dial. Use the regular antenna when adjusting these trimmers.

List of Parts for the One-tube Receiver

The parts listed below for this receiver do not include the chassis or cabinet or dimensions of these units, for reasons explained in the article.

1—Midget Antenna Coil for .00036 mf. variable condenser.
1—Midget R. F. Coil. For .00036 mf. variable condenser.
1—Hytron 25A7 tube.
1—Amphenol octal socket.
1—500,000 ohm Volume Control with switch.
1—Fixed Crystal Detector.
1—300 ohm (or 290 ohm) line cord.
1—Two-gang Variable Condenser—midget type; .00036 mf. each section.
1—625 ohms, ½-watt carbon resistor.
1—5,000 ohms, 1-watt carbon resistor.
1—1,000 ohm, ½-watt carbon resistor.
2—Cornell-Dubilier .05 mf. (400 volts) tubular condensers.
1—Cornell-Dubilier .1 mf. (400 volts) tubular condenser.
1—Cornell-Dubilier .02 mf. (400 volts) tubular condenser.
1—Cornell-Dubilier .001 mica condenser.
1—Cornell-Dubilier .003 mica condenser.
1—Cornell-Dubilier .0005 mica condenser.
1—Cornell-Dubilier 5 mf., 25 volt, electrolytic tubular condenser.
1—Cornell-Dubilier 8-8 mf., 175 volt, electrolytic condenser.
—Oxford or Premier 3" dynamic speaker.

When Lightning Strikes Upward

(*Continued from page* 24)

not to take refuge under a tree during a thunder-storm; there is much greater safety out in the open, away from trees or other high structures, which might lead a lightning discharge to earth. Such discharges have a habit of branching out and even though a person is not standing close to the trunk of a tree, the branching discharges in the immediate vicinity might cause fatal results. In the latest report on lightning researches, Karl B. McEachron, engineer of the General Electric Co., states that the ground all about the base of the tree is quite likely to be covered with sparks and streamers, hence this is a very unhealthy place to find onesself should the tree be struck by a bolt.

A long study of lightning discharges by special cameras has shown that many lightning strokes really consist of a multiplicity of discharges through the same path, but to the unaided eye they appear to be a single stroke only. The peal of thunder following such a multiple lightning stroke is quite likely to resemble a tearing or ripping sound, due to the succession of sounds produced by each succeeding discharge.

The reason for lightning strokes similar to the one shown in the photo, is due to the fact that when a strongly negative charge appears in a cloud over a certain spot on the earth's surface, there is a corresponding positive charge induced in the earth directly underneath the cloud. As is well known, such static

charges leak off a point much more readily than from a flat surface, hence it is easy to see that a tall spire forms a very good discharge point from which the electrical discharge induced in the earth can leak off; in this case *upward*—to act as a "leader" for the charge in the cloud floating above.

"Etiolation"

(*Continued from page* 40)

self is at loss to explain the reason why darkness should favor the production of roots from stem tissue. However, it is a common practice among propagators that, for the best success in the propagation of plants one must resort to the well-known method of *layering*. By this method the soil is drawn up around the young shoots as early as possible, before the tissues become mature and woody.

In his early experiments Mr. Gardner's first problem was to devise a way of etiolating the shoots as they grew on the tree, before removing them for cuttings. For this purpose, ordinary black insulating tape was used. A piece 2½″ to 3″ long is sufficient to wrap spirally four or five times around the young shoots as near the growing tip as possible. The partially expanded leaf or two near the tip are first removed, for if they are bound to the stem all further shoot elongation may be checked. When properly applied, the tape does not interfere with shoot elongation nor with radial growth because the tape gives as the stem diameter increases, but constantly keeping a snug, light-tight covering over this short section of stem during its subsequent development. The application of tape is so readily accomplished that one man can easily tape several thousand shoots in a day, if the size of the tree permits working from the ground.

Much better success can be obtained, says Mr. Gardner, if before wrapping tape around the stem, as explained above, narrow cylindrical bags about 10″ long (see illustration) and made of heavy black mulching paper are fastened over individual shoots so that the initial few inches of growth will be made inside these rigid coverings. After the required growth is obtained the bags are removed and tape applied as before. This method will enhance prompt rooting sometimes in only 3 or 4 days. It seems the growth of the stem in the dark bag aids the growth of the roots. The stem roots at first look like "pimples" (see illustration) in the bud axils; sometimes they grow out under tape to a length of ½″. However, by further experiments, Mr. Gardner discovered that if tape

is not applied to the young "etiolated" shoots at the time the black bags are removed, cuttings subsequently made do not root. This definitely proved that the absence of light at the time the shoots were growing in the bag helped to cause the roots to form in a mysterious manner. Therefore, a period of darkness is necessary to permit further development of the "pimples" which become roots when the tape is applied.

In this manner "etiolated" cuttings, taken early in September from which the bag had been removed 1 month earlier will root very satisfactorily.

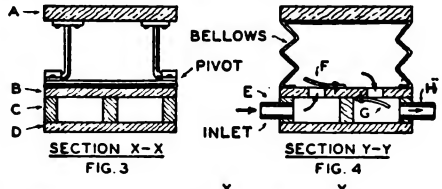
Thus, cuttings prepared in August and stripped of their leaves and planted in the soil early in September will root promptly and vigorously. Fall planting is more feasible; however, shoots thus "etiolated" can be planted in nursery and left to rest over winter; being transplanted in early spring as the soil condition permits.

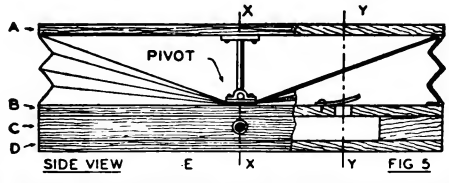
In some cases when the shoots grow in the dark bag they appear white and tender. Sudden exposure to sunlight may kill them before chlorophyll can be produced and normal growth can be resumed. In such cases it is recommended that the experimenter make black mulch paper tubes 3/8" in diameter and 5½" long. These are placed over the shoots (in early spring before growth starts) or at growing tips. These tubes are tightly fastened over the ends of the shoot by means of short pieces of copper wire, in such a manner that the new growth could push its way through the tube and emerge gradually into the sunlight. Later, tape is applied as explained before. However, the first method is far more satisfactory.

Shower Bath for Campers

(*Continued from page* 48)

detailed sketches, the shower bath consists of a simple bellows-operated pump; a few pieces of inner tube tacked down to the wood serve as the valves. The bellows is made of leather or inner tubing; it is operated by the foot of the user. A short section of rubber tubing running to the source of water supply, such as a lake or brook, and another connected to the shower head located near the top of the can-





Details for the construction of the foot-operated pump are given here. Any wood worker will find this job very easy.

vas shower stall (if one is to be used), completes the arrangement.—P. C. VAN PETEGEN.

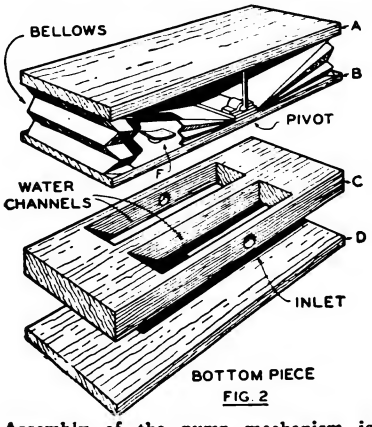


FIG. 2

Assembly of the pump mechanism is illustrated in this diagram.

Make This Simple Swimsail

(*Continued from page* 48)

aft piece which carries the mast, forestay and pulley for the mainsheet. A sponge rubber pad is secured to the forward end and rests upon the breast bone. The device is strapped to the body by a woven elastic fabric belt.

Covered Swing

(*Continued from page* 70)

carriage bolts and lag screws. The seat, back and floor boards should be attached with flathead wood screws.

The builder will note that dimensions are given whenever possible from center to center of bolts.

The construction is simple and sturdy and if the drawing is followed carefully no difficulty will be experienced.

The cover, which is constructed to look like an awning, if framed up somewhat like a hip roof of a house. It has a rectangular

frame made of 2" by 2" material with hip rafters at the corners. These hip rafters are beveled both ways on the top edges and attached to a ridge piece at the top. Over this frame work, tongue and groove ceiling boards are nailed to form the cover. These boards should be placed carefully so that they will come out even at the corners.

To complete the awning effect, short lengths of the ceiling boards should be out with semi-circular ends and nailed around the frame's edges and ends. Following this the joints of the cover boards should be dressed off evenly with a sharp plane.

The four hip corners and the ridge are to be covered with galvanized iron, tin or copper strips. If galvanized iron is used it must be treated with acid or a strong solution of vinegar before it is painted.

A high grade automobile enamel will probably prove more satisfactory than any other paint. It will dry to a good hard finish that will withstand the weather and that will not stick to clothes. The swing illustrated was painted in a dark green with a striped green and white cover.

Popular Magic

(*Continued from page* 55)

the method of operation is absurdly simple.

Explanation: Actually, the envelope is double. There is one ordinary envelope to which the back of another envelope had been pasted; under this back is a duplicate of the card to be selected by the spectator. In the act of cutting a slit through the envelope, the magician also cuts a slit through the duplicate card. Thus, when suspended from the ribbon, the envelope already contains the material necessary for the resurrection. Naturally, the duplicate card is forced upon a spectator (or is removed from a forcing deck in which all of the cards are of one suit). When the pieces are torn up and dropped into the suspended envelope, they actually fall into the unprepared section. Now, when the magician tears open the suspended envelope, he need merely take care to see to it that none of the torn pieces drop to the floor. These, together with the envelope, are crushed between the hands and carelessly tossed aside.

Various divining tricks have originated from time to time; many of them have earned a spot in the programs of present-day magicians. The one here described will be found extremely effective. In demonstration, it is as follows: Four small rods of wood of different colors are passed for inspection, as is a tube into which they fit (many small metal tubes available in pharmaceutical stores could be used for this purpose). During the magician's absence from the room, one of the spectators places a colored wood piece into the tube and conceals the balance. Upon entering the room, the magician holds the metal tube to his forehead and instantly names the color of the wooden dowel which the tube contains.

Explanation: The secret of this trick lies in the fact that although the wooden sticks appear identical, they vary slightly in construction. The green stick is a trifle longer than the rest; the white is a shade thinner and the blue a trifle thicker than either the green or the red. The wizard is able to detect the stick in the metal holder by simple deduction. When the green is inside the metal container the cover does not fit down upon the container tightly. If the white stick is placed into the box, shaking the box up and down announces the presence of this piece by a slight rattle. The red stick does not rattle up and down but will rattle from side to side. The blue one fits perfectly. In making the apparatus, it is merely necessary to cut the sticks all of the same size and increase width or height by the addition of an extra coat of paint.

What to Invent

(*Continued from page* 51)

forgery is just as rampant as it ever was, regardless of the many devices that have been used to prevent it. It appears that everyone but our chemists have tried to solve the problem. But the chemist appears to have a good chance. Assume that the paper upon which checks are printed had been treated chemically and that the ink used in signing them involved a chemical which would react with that in the paper to produce a destinctive color, if the ingredients were kept secret, this invention might be profitable. It would seem that such an idea could be sold to one or two of our larger corporations for a good sum. However, it might not be advisable to have a patent issued.

The hobby of photography is still going strong. Scarcely a day passes without a new photographic aid reaching the market. Among the many things needed is a spring-operated stand upon which a developing tank may be placed. The solutions used for developing require constant agitation during the process for best results. Inasmuch as development requires about 15 minutes, a powerful and large spring motor would be indicated. Such a motor, however, would be far too costly if the device were to enjoy a wide sale. The crux of the problem appears to lie in a motor of the spring type to deliver a periodic kick or jolt to the tank, say once every ten seconds. Worked on this basis, a very small and inexpensive motor could be employed and, once wound up, might operate for a full hour or more. The stand could be sold separately so that any of the small daylight tanks now in wide use could be placed on it.

In every business office of any size, we find a stapling machine; they are noisy things when operated. The tendency in offices is to reduce noise and to increase efficiency. Where only a few sheets of paper are to be wired together, such heavy machines as are now used are quite unnecessary. A hand machine in pincer or plier form, to which the little wire staples used may be fed automatically from a small magazine, is also on the market. Now, who can devise a better, inexpensive and equally positive system?

In any list of household accidents we find frequent references to cuts received from the jagged edges of opened tin cans. Some of these become seriously dangerous; few are the housewives that have not had such mishaps. What is needed is a can opener that will *roll* the cut edges under as it opens a can. From a purely mechanical standpoint this should not be a difficult thing to do and a new and very wide market for can openers of this type would be established immediately. Regardless of the type of can opener found in the home, housewives would want the much improved safety item mentioned.

Every year the women of the United States spend millions of dollars in manicuring their nails. Toiletry of this sort costs money and its performance takes time. Much of the time is spent filing and trimming. We need a new sort of nail clipper to cut a nail in one operation with an acceptable contour and without leaving edges that must be smoothed down by a file. Here is a million-dollar idea. It would not only permit women to reduce the time required for such work, but it would produce a uniformity that is not obtainable now.

The chap who can invent a new form of liquid shaving soap and a little device with which it may be sprayed on the face will become financially independent.

Several millions of dollars is lost in the candy industry each year because chocolate-covered pieces turn gray during hot weather. Will some amateur food chemist find an edible and safe ingredient to prevent this? Five hundred thousand dollars could be demanded for the solution.

Rubbers affect the feet badly, only because ventilation becomes poorer and the feet perspire more freely. Although admittedly a hard nut to crack, the ventilated rubber would find millions of buyers in this country within a few years.

Those who have seen telephone construction gangs digging holes for poles with long-handled shovels must realize that the telephone company could use a gas-driven power machine for this work. Such a machine should be capable of digging a suitable hole of this sort in about 15 minutes.

Sealing wax is still used extensively, but the volume is not nearly as great as it would be if this wax did not need to be heated for each application. A semi-liquid wax is needed, which could be squeezed from a tube and to harden quickly after being applied.

Now that we have photo-electric cells sensitive to color, we also could have a post office canceling machine to check the weight of a letter against the color of the stamp and sort out those letters which need more postage.

Decalcomania transfers are now used widely in industry. We need a small hand machine to speed up the process of putting them in place. Many could be sold in New York at the present time.

Many short-circuits occur in house wiring simply because the holding-down screws in electric plugs become loose and permit the bare wire to roam about. Either a better method of attaching the wires or some means of preventing such screws from loosening is needed today.

Man Nears Automaton Era

(*Continued from page* 84)

kidney. Experiments on animals have demonstrated that artificial external kidneys could be employed, perhaps even on human beings.

By the perfection of the artificial kidney, it would become possible for a person to continue to live without any kidneys whatever. The removal of the gall bladder is common and, of course, the appendix is something that is being done away with many times a day in every hospital. The body would be better off without it. The thyroid gland is frequently extirpated. Many other glands in the human body have been excised either wholly or in part, yet, the organism still continues to function.

Even a large portion of the human brain has been removed and in one notable case all mental functions, including memory, greatly improved. The blood offers no difficult problem. Modern methods of transfusion have been perfected but improvements are constantly being conducted in pump designs, etc. As a matter of fact, Dr. Alexis Carrel and Col. Charles A. Lindbergh have been experimenting with a substitute for the heart pump. This mechanism was reported on at length in a previous issue of this magazine.

The latest method of blood transfusion takes on the form of defibrinated blood stored in bottles and duly classified, so that at a moment's notice a bottle can be lifted off the shelf and its contents can be injected into the recipient who may need this life's fluid.

From the standpoint of sterilizing the blood and killing bacteria or other harmful organisms which may be present, it might be of interest to recall the experiments conducted by the editor of this magazine in cooperation with H. W. Secor and Dr. C. E. Kretz in the laboratories of the Long Island College Hospital, Brooklyn, New York. In these experiments blood was completely drained from an animal, subjected to the influence of ultra-violet and X-ray treatment, passed through osmotic filters and was subsequently returned to the animal. The experiments gave promise of much greater success with the perfection of the incidental apparatus. Some day a similar system will be developed which will eliminate from the bloodstream organisms such as those responsible for malaria, syphilis, pneumonia, and the other virus-borne diseases.

The grafting of skin, bones and other tissues today is rather commonplace.

Two things stand out prominently in this discussion. The providence of nature in equipping man with enough surplus stock, so to speak, that a good portion thereof could fail and yet the body would carry on. Unlike some of the lower animals, man cannot grow another arm or leg. When this is once removed, it is gone forever, but man has the intelligence to develop mechanical substitutes which serve the purpose even though they might never replace the lost member.

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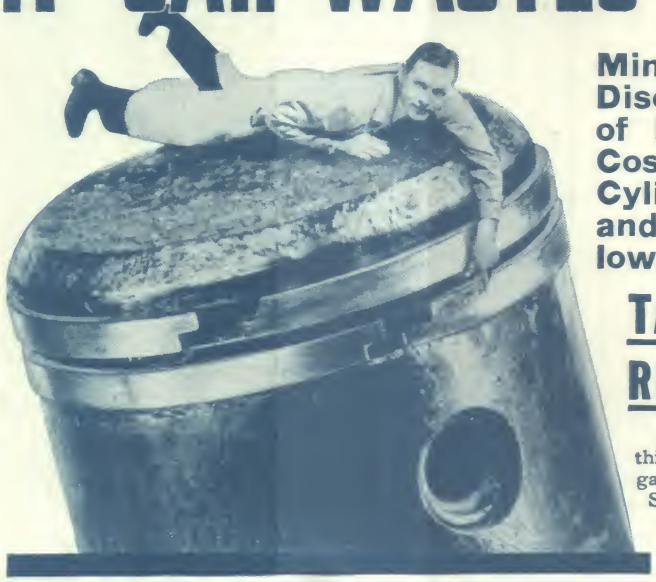

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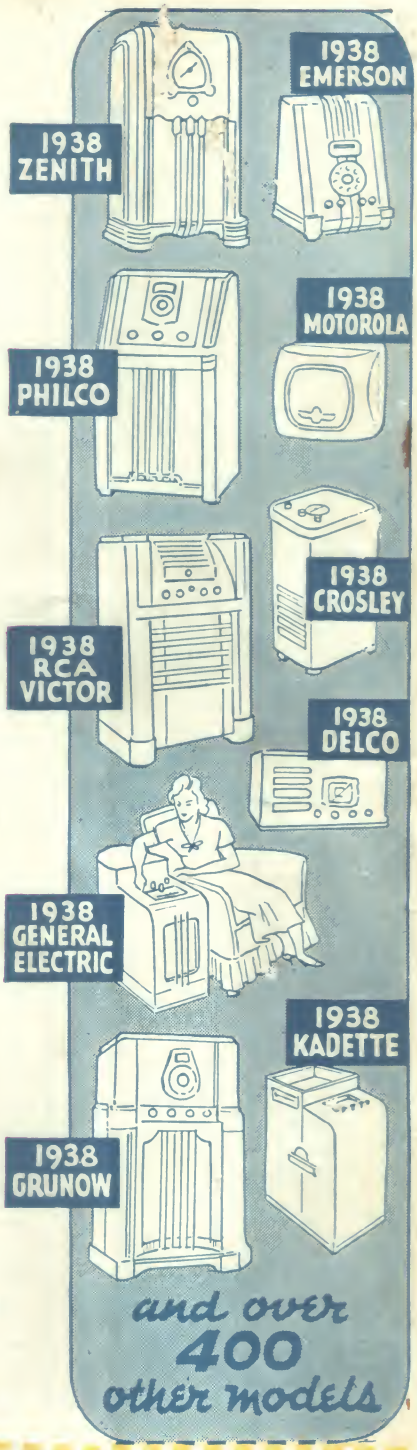

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